



EU Emission Trading – Economical Effects of Emission Auctions

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Content

Preface	7
Summary	9
Abstract	9
Background and problem statement	9
Main conclusions	10
1. Introduction	15
1.1 Topics analyzed in this report.....	15
1.2 About Pöyry Energy Consulting.....	15
2. Auctioning volumes.....	17
2.1 Overview of the EU ETS Third Trading Period	17
2.2 Methodology and calculation approach.....	19
2.3 Assessment of Nordic countries auctioning volumes	24
3. Carbon leakage and free allocation volumes	31
3.1 Free allocation in the Base Scenario.....	31
3.2 Sectorwise analysis of carbon leakage	35
3.3 Carbon leakage in the Directive	36
3.4 Assessment of carbon costs by the Commission	37
3.5 Impact on Nordic allocation volumes.....	42
3.6 Carbon leakage and the Nordic countries.....	43
3.7 Sensitivity analysis on Nordic free allocation volumes	46
4. Recycling of auction revenues	51
4.1 Recycling schemes	53
4.2 Nordic spending on climate abatement and mitigation.....	57
5. Conclusions	65
5.1 Auctioning volumes	65
5.2 Allocation to Nordic installations.....	66
5.3 Auctioning revenues and recycling to the economy	67
References.....	69
Norwegian summary	71
Resymé.....	71
Bakgrunn og problemavgrensning.....	71
Hovedkonklusjoner	72

Preface

In December 2008, the European Parliament approved the Commission's proposal for a directive on the improvement and extension of the emissions trading system (EU ETS). An important part of the agreement is to increase the level of allowance auctioning in the EU ETS. The aim of the project has been to analyze the impacts of the new rules for allocation of emission allowances with a specific focus on the Nordic economies.

The report was commissioned by the Environment and Economy Group of the Nordic Council of Ministers in February 2009. The project leader in the Council was Ulrika Lindstedt from the Swedish Environmental Protection Agency.

The report has been conducted as a literature study, supplemented by collection and analysis of a considerable amount of data in order to quantify the impacts of emissions auctioning. The report has been carried out by Econ Pöyry in Stavanger and Econ Pöyry Copenhagen with Dr. Berit Tennbakk as project manager, and with the participation of Mrs. Franziska Sinner and Dr. Jon Barratt Nysæther. All the conclusions are those of the authors.

Summary

Abstract

This report analyzes the impacts of the new rules for allocation of emission allowances for the third period of the EU emission trading scheme (EU ETS) with a specific focus on the Nordic economies, except Iceland.

We find that annual average auctioning volumes for the Nordic countries (Denmark, Finland, Norway and Sweden) will most likely be around 63 million tons for the whole period 2013–2020.

The auctioning of allowances will hence be a significant source of revenue for the countries' treasuries. The resulting revenue for the Nordic countries' state treasuries, at a carbon price level of 30€/per ton, has been assessed to 1900 million € as the annual average auctioning revenues over the whole trading period.

However, the calculated auctioning volumes and revenues are still afflicted with uncertainties due to the unspecificities in the amended ETS allocation regulation, mainly regarding the definition of industries to be exposed the risk for carbon leakage.

In the case of all ETS industry sectors being classified as being at the risk of exposure to carbon leakage, and hence entitled to receive 100% free allocation as compensation for increased direct carbon costs, the Nordic countries' auctioning volume would be reduced significantly, by 35%, and average annual revenues would drop to 1200 million € from 2013–2020.

Finally, the report concludes that the Nordic countries are likely to spend an amount equivalent to more than 50% of the auctioning revenues on measures related to climate change combat regardless of any provisions for earmarking.

The Directive allows member states to compensate carbon leakage industries for indirect costs of the ETS, i.e. increased electricity prices. Funding for this does not count as a climate combat measure recommended for earmarking.

Background and problem statement

The EU has defined its overall reduction target for greenhouse gas (GHG) emissions with at least -20% by 2020 compared to 1990 emissions.

One main instrument to achieve the GHG emission reduction commitments is the continuation of the EU Emission Trading Scheme (EU ETS) after 2012, when the second trading period ends. According to the

adopted rules for the EU ETS third trading period from 2013 to 2020, the level of allowance auctioning will be increased.

The main purpose of the project is to analyze the implication of the EU ETS allocation rules for the Nordic Countries in terms of auctioning volumes and free allocation to industry. Furthermore, the project should investigate how the revenues from the emissions allowance auctions may be recycled to the economy.

In accordance with the request for proposals, the project consists of five main parts:

- Estimation of the allowance volume that is likely to be auctioned under the new system on an EU wide level and within the Nordic countries.
- Assessment of the sector-wise allocation effects of increased auctioning in the EU ETS from a Nordic perspective.
- Analysis of impacts of carbon leakage on the Nordic industry, its effects on climate (emission reductions) and economical efficiency and how carbon leakage may be avoided.
- Quantification of the resulting effects for the State Finances under various assumptions about auctioning volumes and EUA prices.
- Discussion of the effects and efficiency of different recycling schemes of the estimated auctioning revenues both from a state finance and an economic efficiency perspective.

Iceland is not included in the analysis.

Main conclusions

Auctioning volumes

In the third trading period of the EU ETS, 68% of the total European wide allocation will be auctioned on average. The Nordic countries are entitled to less than 5% of the total EU-wide auctioning volume, shared between Finland (36%), Denmark (30%), Norway (16%) and Sweden (18%). The average auctioning volume over the whole period (2013–3030) in the Nordic countries is expected to be between 350 and 550 million t, depending on how much will be allocated for free to industry and power production. There are still uncertainties with regard to the final implementation of the free allocation rules, for instance which sectors will be deemed to be exposed to “significant risk of carbon leakage” and be entitled to receive 100% allowances for free.

Free allocation to industry will have the largest impact on the total auctioning volume. Combined, free allocation to all industries would reduce the auctioning volume by 35%. The increase in free allowances

under the carbon leakage provision is largest for mineral industry, production of iron and steel and the refinery sector.

Free allocation

For the Nordic countries, Sweden is likely to get the largest free allocation, followed by Finland, with Norway and Denmark at about the same level.

The industrial sectors' free allocation is defined on a European level, not on a country level, and according to common European benchmarks. The share of free allowances likely to be obtained under the carbon leakage provision depends on the industry structure, which varies significantly between the Nordic countries.

Denmark does not have a large energy intensive industry sector, and may receive free allocation mainly for cement & lime production and chemical industry. In Norway the aluminium sector is most important, followed by refineries, and cement & lime. Finland's largest shares are allocated to iron & steel, pulp & paper, and refineries. Sweden is likely to receive the largest free allocation, where allocations to iron & steel, refineries, chemicals, cement & lime, and pulp & paper are significant.

In general, the free allocation volume as a share of the total country's allocation volume may vary depending on the definition of sectors being exposed the risk for carbon leakage. For Sweden, the free allocation volume's share might vary between 45–73% of its total allocation, once there is no industrial sector or there are all industrial sectors exposed carbon leakage and get free allocation. For Denmark and Finland it might only vary between 30–53% and for Norway the free allocation share might vary between 26–54% of its total allocation.

Carbon leakage

Generally, carbon leakage is defined as displacement of emissions from inside to outside the EU ETS, as a result of market distortions caused by the EU-specific emission cost. Industries which are deemed to be at the risk of carbon leakage may get up to 100% allowances allocated for free (relative on the industry benchmark).

The key issues in order to assess the risk of carbon leakage of a specific industry are to evaluate the carbon costs, and what might happen to EU businesses which are exposed to these costs and at the same time face competition from foreign companies who are not exposed to direct or indirect carbon costs.

Based on the EU Commission's definition of exposure to carbon leakage – depending on the sectors' trade intensity and the direct and indirect carbon costs – the Commission concluded in a preliminary assessment and draft decision that the following sectors are likely to meet one of these criteria: the mineral industry, coke oven products, the pulp and pa-

per industry, the metal industry, glass manufacturing and refined petroleum products.

Among the Nordic countries the overall impact of increasing free allocation to industries exposed to carbon leakage is most significant for Denmark and Sweden, although with opposite effects. The total allocation to Denmark is reduced by 7.5 million tons when all industry sectors are classified as “carbon leakage industries”. For Sweden the net gain is 54 million tons. Net gains for Finland and Norway are at 2.5 million and 8.3 million tons respectively.

The EU Commission address carbon leakage by reducing the cost implications of the ETS for industries exposed to international competition. Compensation is to be given as free allocation to the exposed industries, to compensate the direct costs of the ETS, according to specified, common rules for all countries.

Additionally, Member States are allowed to make provisions to account for the indirect costs incurred from increased electricity prices. It is not clear how the indirect costs are to be calculated and whether a common EU factor or formula will be applied. For the Nordic ETS industries it is of special interest that the compensation for indirect cost is considered and calculated in a manner that takes full account of the actual pass-through of carbon costs in Nordic electricity prices. Compared to the European average, emission factors based on the average Nordic countries’ national energy mix would substantially underestimate indirect costs, particularly for Norway and Sweden.

This kind of financial compensation for indirect costs would not fall under the criteria of revenue recycling as defined in EU ETS legislation. Hence, earmarked auctioning revenues may not be used to compensate ETS industries for indirect costs.

Auctioning revenues

The auctioning of allowances may prove to be a significant source of revenue for the countries’ treasuries. As an annual average in the maximum auctioning scenario, Norway is expected to raise 310 million €, Sweden 344 million €, Denmark 552 million € and Finland 692 million € annually for the medium EUA price assumption of 30 €/ton.

The Directive recommends that at least 50% of the auctioning revenues are earmarked for activities and measures directed at climate change combat. This will however not necessarily impose a constraint on spending for the Nordic countries, which already spend considerable amounts on the recommended activities. Based on State budgets for the year 2009 it can be concluded that the Nordic countries are likely to spend an amount equivalent to more than 50% of the auctioning revenues (in the maximum auctioning scenario) on measures related to climate change combat even

without the earmarking provision. We therefore conclude that the earmarking provision is not likely to be binding for the Nordic countries.

1. Introduction

1.1 Topics analyzed in this report

The report presents an analysis of the allocation of allowances for free and by auctioning in the EU ETS Third Trading Period. The focus of the analysis is the implication of different allocation rules for the Nordic Countries, except Iceland, in terms of auctioning volumes and free allocation to industry. The total proportion of allowances that is likely to be auctioned under the new system and the allocation of allowances to be auctioned by the Nordic countries (Denmark, Finland, Norway and Sweden) is estimated, and the resulting auctioning revenue effects are calculated under various reasonable assumptions about auctioning volumes and EUA prices.

Sectors exposed to the risk of carbon leakage will be allocated allowances for free from a common EU pool. These allowances are subtracted from the total EUA volume and allocated to the eligible industry installations directly. The report estimates the allocation of allowances to Nordic industry installations, i.e. in relation to the different industry structures of the Nordic countries, specifying how rules on carbon leakage may influence auctioning volumes.

Finally, we discuss how the national auctioning revenues may be recycled to the economy. The EU Commission, in its amendments of the EU ETS Directive 2003/87/EC, strongly recommends that at least 50% of the auctioning revenue is earmarked for different climate change purposes. The effects and efficiency of earmarking versus other recycling schemes are discussed on a general level.

1.2 About Pöyry Energy Consulting

Pöyry Energy Consulting is Europe's leading energy consultancy providing strategic, commercial, regulatory, and policy advice to Europe's energy markets. Part of Pöyry Plc, the global engineering and consulting firm, Pöyry Energy Consulting merges the expertise of ILEX Energy Consulting, ECON and Convergence Utility Consultants with the management consulting arms of Electrowatt-Ekono and Verbundplan. Our team of 250 energy specialists, located across 14 European offices in 12 countries, offers unparalleled expertise in the rapidly changing energy sector. Pöyry is a global consulting and engineering firm focusing on the energy, forest industry, infrastructure, and environment sectors.

2. Auctioning volumes

In this chapter we will present an overview of the allocation rules and principles for the third trading period and estimate the value of the auctioning volumes allocated to the Nordic countries, under various assumptions.

2.1 Overview of the EU ETS Third Trading Period

The Council and European Parliament recently adopted the EU Commission's Climate and Energy package from January 2008. The package implies a cut in EU greenhouse gas (GHG) emissions by at least 20% by 2020 compared to 1990 emissions. If global targets are agreed in the ongoing international climate negotiations the EU is prepared to reduce its emissions by 30%.

The total necessary GHG emission reduction efforts are divided between the sectors included in the emission trading scheme (EU ETS) and non-ETS sectors. The ETS sectors are power and heat production, plus a number of emission-intensive industries.

The non-ETS sectors (transport, households and the remaining industrial sectors) are expected to realize a 10% reduction compared to 2005 emission levels.

For the EU ETS sectors, the adopted EU Package contains amendments on the EU ETS Directive 2003/87/EC for the third trading period (2013–2020).¹ The most important amendment is the harmonisation of the national caps and the rules for allocation of allowances to ETS installations. The total cap in 2020 (issued EU allowances) is to be reduced by 21% compared to 2005 verified emissions, corresponding to a linear annual reduction of 1.74% compared to the 2008–2012 average, from 2013–2020 and beyond. As of 2008, the EU ETS applies to the 27 EU Member States plus the members of the European Economic Area (EEA): Norway, Iceland and Liechtenstein.

The Emission Trading Directive (2003/87/EC) was included in the EEA Agreement by EEA Joint Committee Decision No. 146/2007 on 26 October 2007. The EEA EFTA States were granted an adaptation allowing the EEA EFTA States to allocate a greater percentage, for the periods referred to in Article 11(2), of its allowances against payment than any other limitation established under Article 10. Norway and the other EEA-

¹ See EU Commission, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008PC0018:EN:NOT> Proposal for a directive of the European parliament and of the council on the improvement and extension of the emissions trading system of the community, COM(2008) 16 final, 2008/0013 (COD).

countries are now in a process of considering the revised directive including adaptations.

In contrast to the first two ETS periods, where almost all allowances were given out for free, the main portion of the allowances will be auctioned in the third period. The share of allowance auctioning will be at least 50% from 2013. The share of auctioning is however different from sector to sector. For electricity generation the general allocation rule will be full auctioning, with some exemptions. This means that most power generators will have to buy all their emission allowances from 2013 and onwards. For industry sectors, the general rule is that the share of auctioning is set to rise every year, reaching 70% in 2020 and 100% in 2027. Industry sectors who are classified as being exposed to a significant risk of so-called carbon leakage, i.e. industries which compete in a global market with producers who are not subject to emission reduction requirements, may continue to receive up to 100% allowances for free. Alternatively, other types of compensation may be given in a transition phase.

In addition to the changes in the allocation rules, the amendments include:

- **Opt-out for small installations:** A large number of installations currently covered by the EU ETS are emitting relatively low amounts of CO₂ and the cost-effectiveness of the inclusion of them is questionable. The EU Commission therefore allows the removal of small installations from the scheme, so-called opt-out, but only if the installations are covered by measures that will achieve an equivalent contribution to emission reductions. The maximum emission threshold for opting out for eligible installations from the trading scheme will be 25,000 tonnes of CO₂ per year (combustion installations have an additional threshold of 25 MW installed capacity).
- **Inclusion of new gases and sectors:** In the third trading period, the scope of the EU ETS will be extended to new gases – N₂O and perfluorocarbons – and new sectors – aluminium, chemicals, and carbon capture and storage. The aviation sector will be included into the system from 2012.

The auctioning of allowances is expected to generate substantial amounts of revenues for the Member States. The Directive recommends that at least half of the auctioning revenues are spent on actions to combat climate change, either in the EU or in developing countries.

2.2 Methodology and calculation approach

Allocation rules

To determine the Nordic countries' auctioning volume, EU's allocation rules for the third EU ETS period must first be assessed. The main rules for allocation are laid out in the amendment to the EU ETS Directive 2003/87/EC.² Detailed rules on auctioning will be specified in a separate regulation on auctioning, expected to be published by the Commission by 30 June 2010. The definition of industries at risk of carbon leakage and benchmarks for free allocation are also going to be decided in 2010. Since definitions and specifications are still outstanding, the outcome is uncertain. The Commission is going to decide the overall amount of allowances in September 2010, and by the end of the year the amount of allowances to be auctioned.

The Directive specifies the following general rules for allocation volume:

1. The EU overall allocation volume is based on the allocation for the period 2008–12 and will decrease annually in a linear manner so that it reaches the overall reduction target of 21% in 2020 (compared to 2005 verified emissions). However, the total volume will take into account the new sectors and gases that are added, and the opting out of small installations.
2. 5% of the overall EU allocation volume over the period 2013–2020 will be set aside for new entrants as a new entrants reserve (NER)
3. The share of auctioned allowances mainly depends on the assessment of the sector specific allocation rules:
 - As a main rule the free allocation to industrial sectors will be made according to Community wide ex-ante product specific benchmarks. These are to be based on the average performance of the 10% most efficient installations in a sector in the years 2007–2008.
 - Industrial sectors not exposed to the risk of carbon leakage will be exposed to 20% auctioning in 2013, increasing linearly up to 70% in 2020 and 100% auctioning in 2027.
 - Industrial sectors exposed to the risk of carbon leakage will not be exposed to auctioning; hence they will be allocated 100% of their share in the annually declining total EU-wide quantity of allowances to be allocated for free. The amount of free allocation is

² Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community. PE-CONS 3737/08, 26.March 2009, <http://register.consilium.europa.eu/pdf/en/08/st03/st03737.en08.pdf>

determined based on their share of total EU ETS emissions in 2005–2007.

- All electricity provided by combustion installations will be exposed to 100% auctioning, with the following exceptions:
 - The exception rule for an optional and temporary derogation from the 100% auctioning rule will be applied for relevant countries.³
 - Highly efficient CHP plants will get free allocation for its heat production.
 - Power produced by waste gases and district heating may receive allowances for free.
4. The EU Directive specifies in detail how the EU-wide auctioning volume is to be distributed among the Member states:
- 5.
- 88% is distributed to the Member states according to 2005 or average of 2005–07 verified emissions, whichever is the higher.
 - 10% is distributed according to a specific rule depending on GDP growth, defined in the EU ETS Directive
 - 2% is distributed to Member States whose 2005 verified emissions were at least 20% below their Kyoto baseline (mostly 1990 levels).

Method for determining auctioning volumes

Our approach to determine specific auctioning volumes for the Nordic countries is illustrated in Figure 1.

³ According to the EU ETS Directive, an exception of max 70% free allocation to the power sector in 2013 may be given to countries which fulfil certain conditions on the interconnectivity of the electricity grid, the share of a single fossil fuel in total electricity production, and the GDP per capita compared to EU average. It has been evaluated that this applies to the following countries: Hungary, Czech, Estonia, Poland, Bulgaria, Romania, Ireland, Malta and Latvia

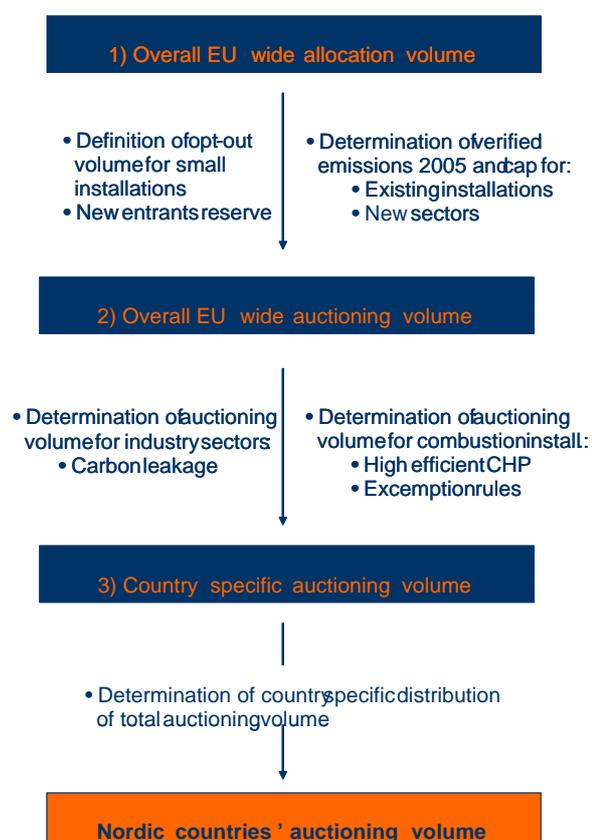


Figure 1: Schematic approach to determine auctioning volumes

The calculation path, its assumptions and the main used data sources are the following:

- Europeanwide allocation:*
 Calculation of the total Europeanwide allocation volume issued each year: mid-point of the period 2008–2012 allocation reduced by 1.74% per annum.
Data used: Average allocation of the Second trading period 2008–2012 deriving from Second National Allocation Plans
- Basis for calculation of industrial sectors free allocation:*
 Calculation of the industry sectors' share of allowances: The total Europeanwide allocation volume multiplied with the sectors' share of verified emissions in the period 2005–2007.
Data used: Average verified emissions for 2005–2007 deriving from the Community Independent Transaction Log.
- Industrial sectors' free allocation according to the general rule*
 Calculation of industrial sectors' free allocation: the industrial sectors' allocation will be based on ex-ante benchmarks, which are not

yet defined.⁴ However, the total amount of free allocation is not allowed to exceed 80% of the total industrial sectors' allocation in 2013, declining until 2020 to 30%, according to the general allocation rule.

Assumptions: In the calculations for the Base Scenario (see next section) it has been assumed that 60% of the total allowed industrial sectors allocation amount is allocated for free.

4. Power and Heat sector's free allocation

Calculation of free allocation for heat production: District heating and highly efficient CHP plants receive free allocation for the heat produced. However, it is not yet quantified what "high efficiency" means in terms of plant efficiency.

Data used: emission levels from heat and CHP production deriving from the impact assessment of the EU Commission.⁵

In general, the power sector will receive no free allocation for emission from power generation. However, some exemption rules apply for electricity generation in countries which fulfil certain conditions on the interconnectivity of the electricity grid, the share of a single fossil fuel in total electricity and GDP per capita. The EU Commission allows for 70% free allocation in 2013 declining to 0% free allocation in 2020, once countries qualify for these exemption rules (see above).

Data used: GDP data per capita as well as the share of a single fossil fuel in the generation mix has been taken from the impact assessment of the EU Commission (see footnote 5).

5. New entrant reserve

Determination of New entrants reserve (NER): 5% of total EU wide allocation amount is to be reserved for new entrants.

6. Europeanwide auctioning volume

Calculation of the allocation volume which will be auctioned: Remaining allocation volume once the NER (the share which will be allocated to new entrants) and free allocation volume to industry and the power and heat sector are subtracted from the overall Europeanwide allocation volume.

⁴ The Commission will publish draft benchmarks in Spring 2010.

⁵ The EU Commission has done a Joint impact assessment on the package of implementation measures for the EU's objectives on climate change and renewable energy for 2020. As part of this, a model based analysis has been done with the help of the PRIMES model which underlying data has been used here. http://ec.europa.eu/environment/climat/climate_action.htm

Basic assumptions for the calculations

As discussed above, some crucial details of the allocation rules are still undecided, and the final regulations will not be defined before 2010.

In order to quantify the auctioning volumes for each Nordic country in light of the existing uncertainty, we have built a simplified calculation tool based on the verified emissions from 2005–2007 and some basic assumptions regarding the future allocation rules. These assumptions are reflected in a Base Scenario as defined below.

The Base scenario does not represent a best guess scenario, but rather serves as a reference for analyzing how changes in uncertain assumptions change the auctioning volumes. Afterwards, the impacts of each uncertain allocation rule will be assessed in regard to its influence on the free allocation volume, i.e. how different interpretations and implementations change the auctioning volume relative to the Base scenario.

The “Base scenario” includes the following assumptions:

- Small installations’ opt-out: 50% of all installation below 25 000 Mt/a are opted out.
- Heat sector allocation: district heating plants and 50% of all heat production derived from highly efficient CHP plants which meet the energy efficiency condition receives free allocation. Hence, in 2013, 50% of the total heat production receives free allowances. The free allocation is reduced by the linear factor of 1.74% per annum.
- We have evaluated that the exemption rules for free allocation to electricity generation most likely apply to the following countries: Hungary, Czech, Estonia, Poland, Bulgaria, Romania, Ireland, Malta, Cyprus and Latvia. Taken together, this means that the power sector will receive allowances for a total of 410 million tons for free over the period 2013–2020.
- Industrial sector allocation: Industry sectors receive 60% of their maximum allocation for free in 2013 declining to 30% allocation in 2020. The basis for the allocation volume is the total average verified emissions in the period 2005–2007 from installations covered from 2008–2012 (Article 10a 5).
- Carbon leakage: We assume that none of the ETS industrial sectors meet the criteria for being at risk of carbon leakage, and therefore no industrial sector will get 100% free allocation. Free allocation to all industries is given according to the general rule.
- New Entrants Reserve: 5% of the total annual allocation volume (of which 300 Mt are earmarked for CCS) goes to the New Entrants Reserve. In the Base scenario we have assumed that of the total NER volume 75% is allocated for free, the remaining part will be auctioned. This is based on experiences from the first trading period, and reflect the uncertainty of allocations from the NER.

Based on the above assumptions and the allocation rules indicated by the EU Commission, the designed calculation tool estimates the future EU-wide allocation volume, the auctioning volume, and the free allocation volumes per country. Due to the mentioned uncertainties, these volumes do of course represent rough estimates based on the applied assumptions.

When the auctioning volume for each Nordic country has been determined, the resulting revenues from auctioning are estimated. To estimate the future carbon price, recent in-house price projections have been used. The auctioning revenues will be calculated country-wise for the base scenario with a carbon price of 30€/ton and for two other carbon price levels, corresponding to a projected low (20 €/ton) and high (40€/ton) carbon price.

2.3 Assessment of Nordic countries auctioning volumes

This section presents the calculated overall auctioning and free allocation volumes for the above described Base Scenario, and how it is affected by changes in the assumptions about free allocation. The Nordic countries' auctioning volumes and their auctioning revenues are presented in more detail. In the next chapter we present the free allocation to the Nordic countries under different assumptions.

Europeanwide auctioning volumes

Under the described Base Scenario assumptions and following the above described calculation approach, the total EU allocation volume and the EU auctioning volume are shown in Table 1.

Table 1: Calculated allocation volumes for EU 27 plus Norway, third ETS period

	Year	2013	2014	2015	2016	2017	2018	2019	2020
New Entrants Reserve	Mio t/a	75	73	72	70	69	68	66	65
Total auctioning	Mio t/a	1313	1353	1382	1410	1437	1460	1482	1502
<i>Free allocation el</i>	Mio t/a	219	200	182	164	147	130	114	98
<i>Free allocation non-el</i>	Mio t/a	594	541	490	440	393	346	302	259
Total free allocation	Mio t/a	813	741	672	604	539	476	415	357
Total allocation	Mio t/a	2201	2167	2126	2085	2045	2004	1964	1924

The overall auctioning volume is calculated by subtracting the new entrants reserve and the free allocation volumes from the total Europeanwide allocation. Over time, the auctioning volume is increasing since free allocation to industry and power and heat generation is reduced (Figure 2).

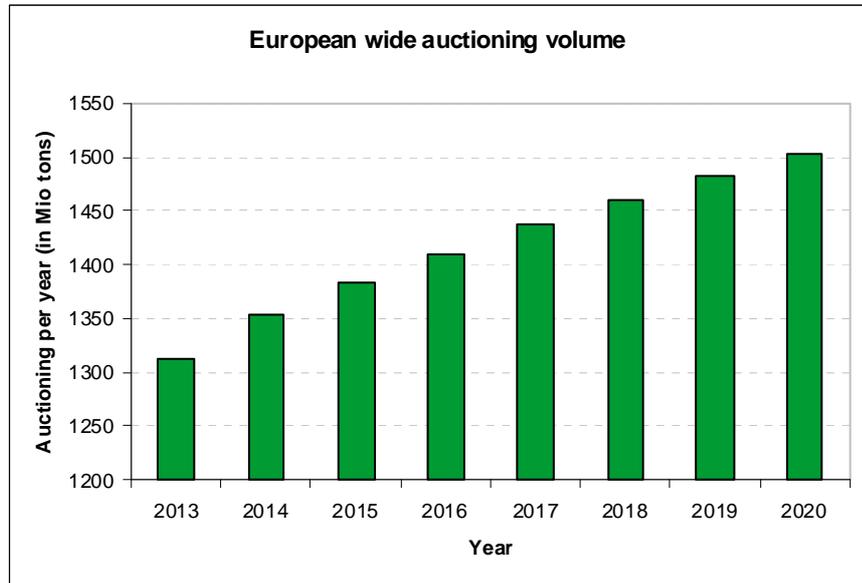


Figure 2: Europewide EU ETS auctioning volumes from 2013–2020

The average Europewide auction volume of the third EU ETS trading period is about 1417 million tons. But the calculated volumes are afflicted with uncertainties since some of the specific allocation regulations have not yet been designed. Assumptions had to be made, especially in regard to free allocation for industry and power and heat generation, but also in regard to the overall coverage of the scheme and the share of the NER which will not be used and finally auctioned. All these factors affect the European auctioning volume.

In order to assess the sensitivity of the Europewide auctioning volume, we have analyzed the effects of the following changes, relative to the Base Scenario (Table 2):

Table 2: Changed assumptions from the Base Scenario

Base Scenario	Changed assumptions
75% of NER has been used (25% auctioned)	100% of NER will be used (0% auctioned)
50% of small installations are opted out	100% of small installations are opted out
50% of heat production receives free allocation	75% of heat production receives free allocation
Free allocation to industry not exposed to risk of carbon leakage: 60% of total allocation maximum	Free allocation to industry not exposed risk of carbon leakage: 80% of total allocation maximum

The perhaps most important sensitivity is the effect of defining industries as exposed to carbon leakage. The effect of classifying different sectors as exposed to carbon leakage is presented in detail below.

Figure 3 shows how the sensitivities listed above impact the overall auctioning volume, compared to the Base Scenario.

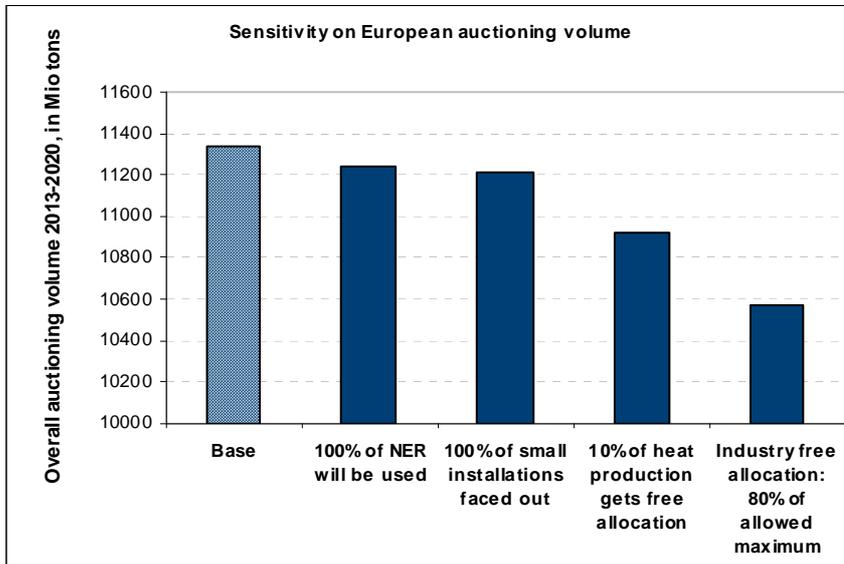


Figure 3: Sensitivities on the Europeanwide EU ETS auctioning volumes

It is clear that the opt-out of more small installations and a larger allocation to heat production have a negligible effect on the overall auctioning volume. It is the assumptions on the free allocation for the industry that has the most significant effect on the auctioning volume. The lower the Europeanwide free allocation volume is, the higher the auctioning volume for the whole Europe. Moreover, the free allocation volume will very much depend on the assumptions regarding carbon leakage.

The above sensitivity analysis assumes that all ETS industrial sectors are allocated allowances according to the basic rule. However, according to the EU Commissions preliminary assessment, there are several sectors which are likely to meet the criteria to get a higher share of free allocation. These sectors are metal production, aluminium production, pulp and paper manufacturing, glass and ceramic manufacturing, production of basic chemicals, refined petroleum products and the cement and lime production. More details on the sectors' exposure to risk of carbon leakage will be described in chapter 3.

Nevertheless, if a sector is defined as being significantly exposed to carbon leakage, it will get 100% free allocation throughout the third trading period, instead of 60% declining to 30% in 2020 as assumed in the Base Scenario. Depending on the sector's share of 2005 verified emissions, the higher share of free allocation reduces the overall EU-wide auctioning volume, since the total allocation volume (issued allowances, or the cap) stays constant.

Figure 4 indicates the different Europeanwide auctioning volumes once industrial sectors are classified as being exposed to the risk of carbon leakage, and hence receive 100% free allocation. Each column represents the auctioning volume based on the Base scenario assumptions but with the appropriate sector receiving 100% free allocation.

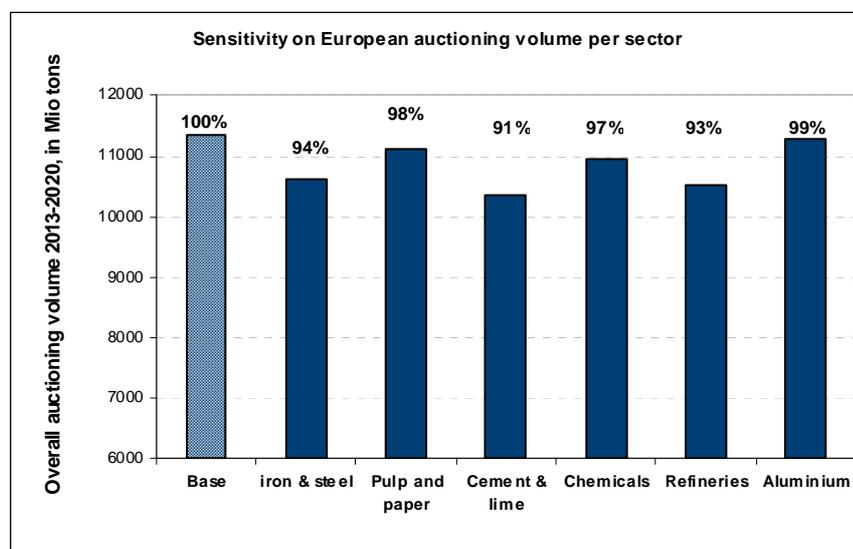


Figure 4: Sensitivities on EU ETS auctioning volume once industrial sectors are exposed to the risk of carbon leakage

On a European level the mineral industry (cement and lime sector) has the strongest impact on the auctioning volume, as well as Refineries (including the offshore petroleum sector) and the Iron and steel industry. If these sectors receive 100% free allocation, the auctioning volume is reduced by 9% for Cement & lime, by 7% for Refineries and by 6% for Iron and steel. The Aluminium sector has the lowest impact and only reduces the auctioning volume by less than 1% once it receives free allocation.

The Nordic countries auctioning volumes and revenues

The Nordic countries' auctioning volumes are determined by the Europeanwide harmonised allocation rules. The Europeanwide auctioning volume is distributed to each Member State based on shares depending on historical emissions.

In total, the Nordic countries are entitled to a little less than 5% of the total EU wide auctioning volume. Of this amount, Finland holds the biggest share of 36%, Denmark holds 30%, Norway 16% and Sweden 18%.

In the Base Scenario the total Nordic annual average auctioning volume is about 63 million tons. Over time, the annual auctioning volumes are increasing mainly because free allocation to industry declines from 60% in 2013 to 30% in 2020 (Figure 5). But also free allocation to the power sector is slowly reduced, so that installations qualifying for free allocation due to the exemption rules will receive 100% auctioning in 2020.

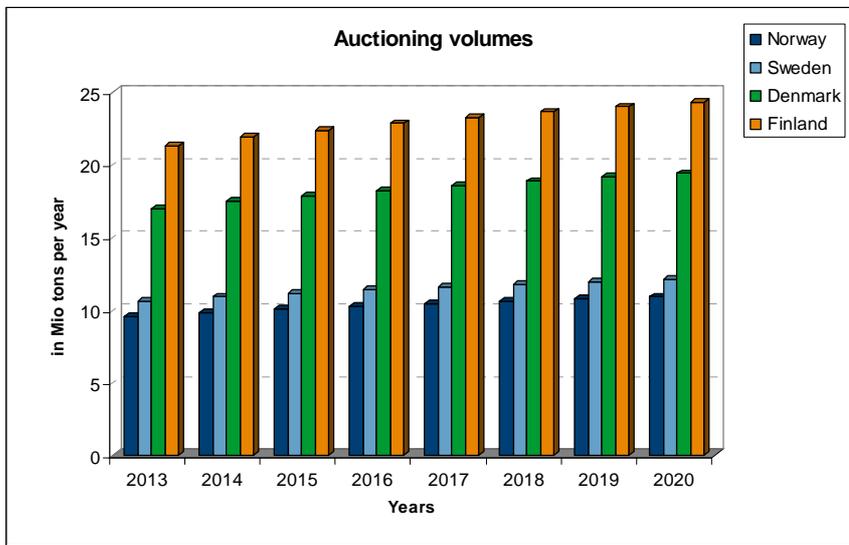


Figure 5: Auctioning volumes for the Base Scenario from 2013 –2020

Figure 6 shows the country-wise calculations of revenues for the base scenario, assuming a carbon price of 30€/ton, and for two other carbon price levels, corresponding to a projected low (20 €/ton) and high (40 €/ton) price level.

In Figure 7, the auctioning volume for the Nordic countries over the whole period can be seen for the Base scenario and for the extreme case where all industrial sectors in question would be exposed to risk for carbon leakage and receive 100% free allocation. This represents the lowest possible auctioning volume the Nordics may get allocated.

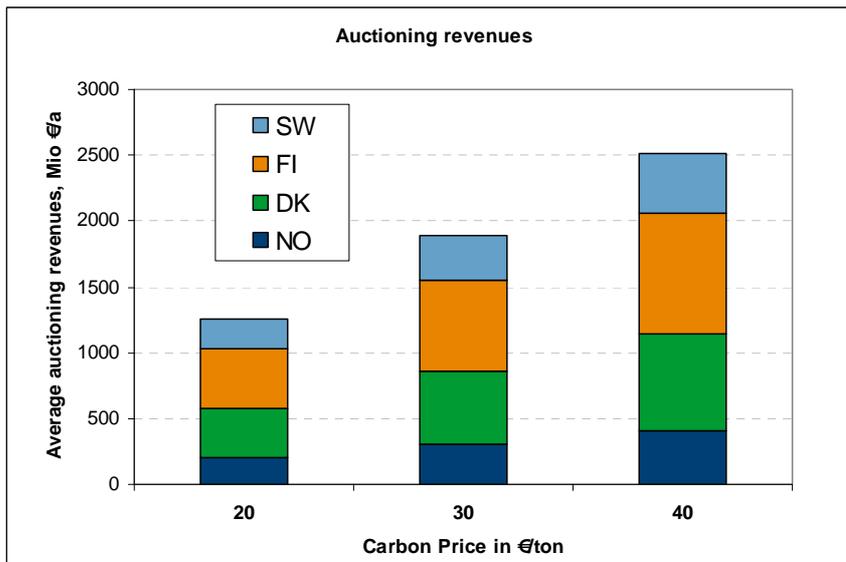


Figure 6: Auctioning revenues for the Base Scenario at different carbon prices

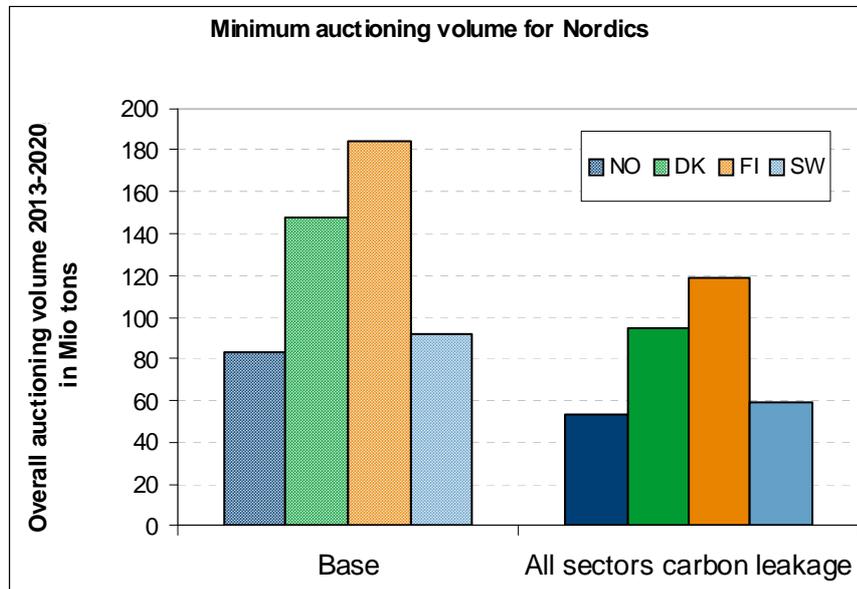


Figure 7: Auctioning revenues under the assumption that all industrial sectors are exposed to risk of carbon leakage

In accordance with the calculated auctioning volumes, in the Base Scenario (carbon price of 30 €/ton) Norway and Sweden receive the lowest revenues. As an annual average, Norway would receive 310 million € and Sweden 344 million €. Denmark would receive 552 million € and Finland would receive the highest amount of revenues, 692 million € annually.

3. Carbon leakage and free allocation volumes

In this chapter we present the allocation of free allowances to the Nordic countries, and focus in particular on the implications of free allocation of allowances to industries which meet the criteria for being exposed to significant risk of carbon leakage. First we discuss which sectors are likely to be included, and then we assess the free allocation for these industries in the Nordic countries. A brief discussion about the implications of carbon leakage is included at the end of the chapter.

3.1 Free allocation in the Base Scenario

Beside the auctioning revenues, the Nordic countries will also receive some free allocation, mainly to the industry. The industrial sectors' free allocation is defined on a European level, not on a country level, and according to common European benchmarks. Depending on a country's early actions as well as its conditions in how modernized the industrial production actually is, some industrial plants may need to purchase extra emission allowances in order to cover its emissions.

However, in the above explained calculations, since benchmarks are not yet available, we have assumed that free allocation to industry is 60% of its total allowed allocation (which is based on verified emissions in 2005–07).

Hence, the Nordic countries will receive different volumes for free allocation depending on their industrial structure. For the Nordic countries, the Base Scenario calculation shows that the average annual free allocation volume would be 3.6 million t/a for the Norwegian industries, 4.1 million t/a for the Danish industries, 8.7 million t/a for Swedish industries, and 6.4 million t/a for Finnish industries.

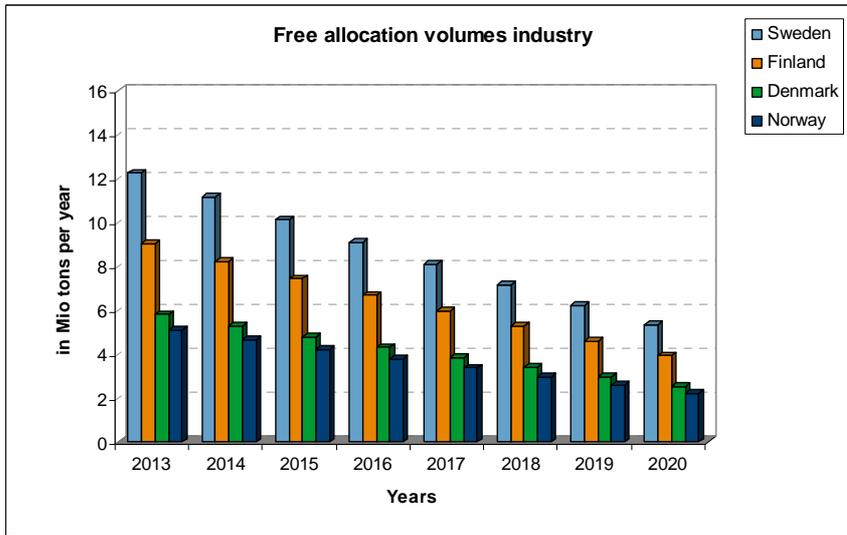


Figure 8: Free allocation volumes for Nordic industry in the Base Scenario

Figure 8 shows free allocation to industry in the base scenario. The countries’ power and heat sectors will receive some additional free allocation for installations which meet the criteria for high efficiently produced heat from CHP plants. The free allocation volumes to power and heat production are about 4.5 million t/a for Denmark, 2.9 million t/a for Finland, 0.6 million t/a for Sweden, and Norway would get less than 0.1 million t/a of free allocation.

The summarized country specific auctioning and free allocation volumes calculated for the Nordic countries are shown in Figure 9.

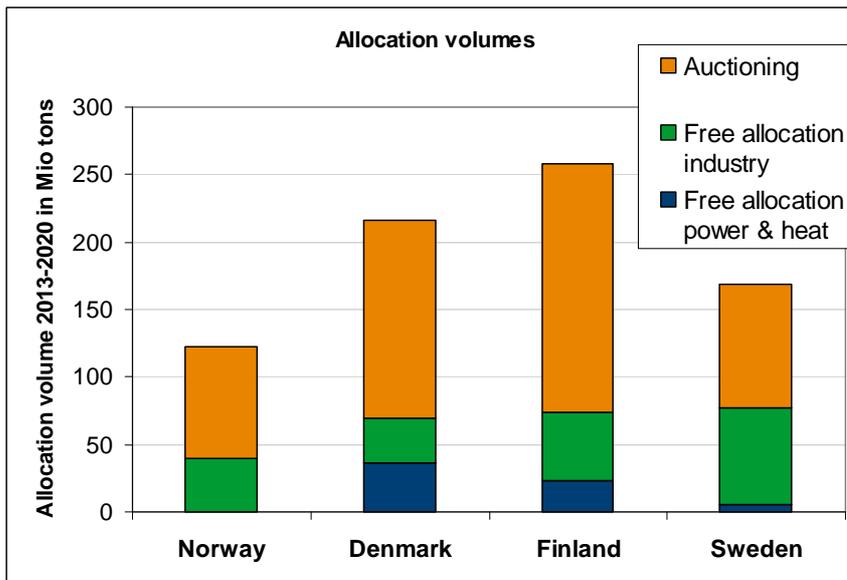


Figure 9: Auctioning and free allocation volumes for the Base Scenario

Comparing the free allocation volumes in figure 9 with the countries' auctioning volumes shows that Sweden receives the relatively highest share (45%) of free allocation compared to its total allocation volume, followed by Norway (26%) and Finland (29%). Denmark, which has the relatively lowest share of its total emissions deriving from industrial sectors, gets only 8.5 million t/a allocated for free, which is about 31% of its total allocation.

The calculated countries' free and auctioning allocation volumes are still afflicted with uncertainties due to the uncertainties in the amended ETS allocation regulation. Assumptions had to be made in regard to the overall coverage of the scheme and the small installations opt-out, the amount of heat plants meeting the requirement of free allocation for heat, the amount of free allocation to the combustion installations meeting the requirement for the exemption rule and the share of the NER which will not be used and finally auctioned. All these factors will affect the countries' individual free allocation volume to industry.

If more allowances are allocated for free, the auctioning volume would be reduced, but the relative distribution of the auctioning volume between member states would be the same. We return to the implications of allocating more allowances for free below.

Furthermore, the overall country-wide free allocation volumes depend on the industrial structure within the relevant Member State. Furthermore, as soon as sectors are exposed to carbon leakage and they present a significant share of a Member states' total emissions, this Member state would receive a relatively higher free allocation share than countries with sectors mainly receiving allowances for auctioning.

The Nordic countries industry structure

The sectoral emission distribution among the Nordic countries gives information about the industry structure within the countries. The average sectoral emissions for the first two years of the EU ETS can be seen in Figure 10.

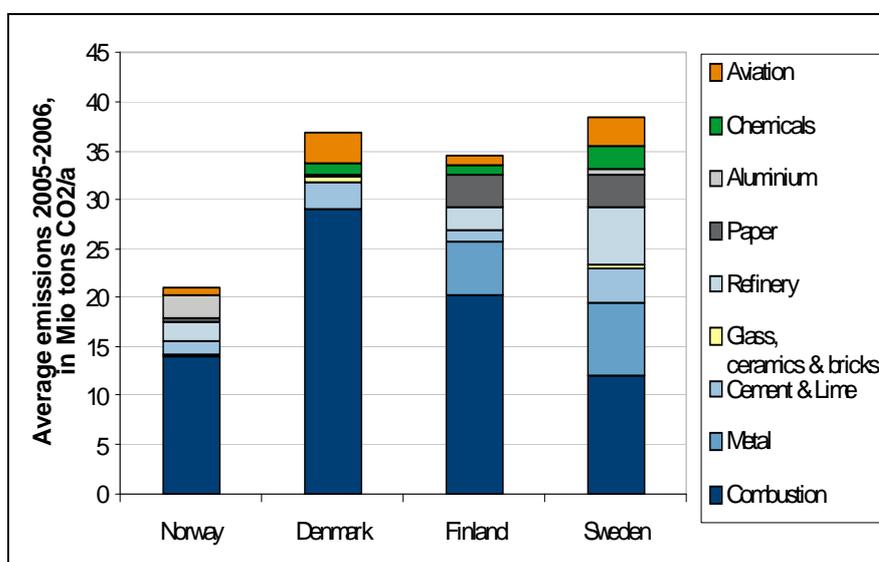


Figure 10: Sectoral distribution of total emissions in the Nordic countries, average emission levels 2005–2006

The data are derived from the countries' verified emission reports from 2005–2006 and the report "Developing the EU Emissions Trading Scheme" published by the Nordic council of Ministers in 2007. The latter has analysed the industry structure in terms of emissions levels within the Nordic countries.⁶ Table 3 indicates the share of the industry sector's 2005–2007 average emissions in the Nordic countries. It is based on the analysis of the Nordic Council of Minister's report, but additional sectors are added referring to the extended coverage of the third EU ETS period. Emission data for the new sectors, aluminium, chemicals and aviation, stems from the European Environmental Agency⁷ and only refers to the year 2005. Norwegian data stems from the Second National Allocation Plan and Statistics Norway.

Table 3: Share of sectors' 2005–2006 average emissions in the Nordic countries

* The Norwegian power sector includes all offshore installations and natural gas refineries and only presents the emission

	Power & heat	Iron and steel	Cement & lime	Glass, ceramics & bricks	Refinery	Pulp and paper	Aviation	Chemicals	Aluminium
Norway*	66.7%	0.3%	6.2%	0.1%	9.3%	2.5%	3.8%	0.8%	10.3%
Denmark	78.1%	0.0%	7.9%	0.9%	0.9%	0.0%	8.7%	3.5%	0.2%
Finland	60.0%	15.2%	3.8%	0.0%	6.7%	9.5%	2.5%	2.3%	0.0%
Sweden	29.2%	16.9%	8.5%	0.8%	13.8%	7.7%	11.8%	9.1%	2.2%

shares for the year 2005.

Source: TemaNord 2007:611, Norway's second Allocation Plan, EU impact assessment on EU ETS

In general, Figure 10 and Table 3 demonstrate the difference in the Nordic countries' industrial structure. Most significant is the different share of the industrial and aviation sectors' emissions of the total national emission volume. In Denmark, the industrial sectors (including aviation) present only 20% of the country's total ETS emission volume. Finnish in-

⁶ TemaNord 2007:611

⁷ European GHG emissions 2007, http://reports.eea.europa.eu/eea_report_2007_5/en

dustry sectors hold a share of 40%, in Norway the share lies at 35% and in Sweden, the share of industry is about 70%.

3.2 Sectorwise analysis of carbon leakage

Carbon leakage can be defined as displacement of emissions from inside to outside the EU ETS, as a result of market distortions caused by the EU-specific allowance cost. Industries which are deemed to be at the risk of carbon leakage may get up to 100% allowances allocated for free (based on the industry benchmark).

The definition of what it means that a sector is “exposed to significant risk of carbon leakage” takes into account both the direct effect of the carbon cost on the industry (through the CO₂ price) and the exposure to indirect carbon costs (through electricity price increase) on the sectors competitiveness.

Hence, the key issues are to evaluate the likely increase in carbon costs in the future and what might happen to EU businesses which are exposed to these costs and at the same time face competition from foreign companies who are not exposed to direct or indirect carbon costs.

Leakage of emissions occurs if production in the EU companies is replaced by increased production or investments in countries outside the EU. Hence, increased imports and/or loss of exports as well as emigration of plant as a result of increased carbon costs represent carbon leakage.

The extent of carbon leakage mainly depends on the extent to which a sector can pass through carbon costs in product prices. This depends on the competitive pressure in the sector in question and transportation costs. Some industries may be able to pass some of the carbon costs through to product prices, but the fiercer the competition and the lower the transportation costs, the higher the risk to lose market shares to foreign competition.

The response to increased carbon cost will probably be different for different sectors and industries. Assume that an ETS installation raises product prices from an existing facility to reflect the ‘cost of carbon’, and customers react by choosing to buy from companies outside the EU ETS. The facility will then operate at below capacity, and some carbon will have ‘leaked’. However, because the producer will be emitting less carbon, it may have surplus allowances to sell (or will need to buy less). Depending on the price-sensitivity of their customers and the fixed/ variable cost split of the facility, this may still therefore be a profitable strategy. Hence, the resulting leakage does not change the optimal decision, though it does alter the overall profitability of the firm whatever choice it makes.

Another kind of carbon leakage may occur through future investments in production facilities. Here, the issue of competition for capital within and between international companies has to be discussed, as mainly influenced by expectations about future trends. If companies expect a sus-

tained carbon price differential between Europe and elsewhere, the return on investments in carbon-intensive facilities outside Europe will be increased relative to investments with Europe, at anything less than 100% free allocation. For instance, investments can be made in facilities abroad with the intention to import back into Europe. There are however considerable commercial risks associated with such investments if future international agreements or other measures are adapted to compensate for carbon price differences.⁸ Investment decisions will thus be influenced also by expectations about the measures that may be taken to tackle carbon leakage.⁹

In general the risk of carbon leakage depends to a large extent on the expected carbon price.

3.3 Carbon leakage in the Directive

The EU Commission relates the risk to be exposed to competition and carbon leakage to two main indicators:

1. Carbon costs
2. Intensity of competition

Carbon costs relates to the effects of carbon pricing on the cost structure of the industry products. As mentioned above, the EU ETS may have direct and indirect effects on the production costs of industries. Direct costs are caused by emissions originating from the production process itself (which include energy and process emissions); for these emissions operators are obliged to submit EU allowances. Indirect costs are caused by, for example, higher electricity prices since electricity generators pass on the marginal carbon costs to consumers. The carbon cost of an industry is determined by its contribution to production costs, calculated as a proportion of the sector's GVA (gross value added) induced by the implementation of the Directive.

The *intensity of competition* for ETS installations towards non EU ETS countries differs significantly between industrial sectors. Sectors which export large shares of their domestic production or face high competition from imports for their domestic sales are likely to be most affected by carbon leakage.

To measure the intensity of foreign competition on domestic markets the EU Commission has defined the 'trade intensity' as an indicator. The

⁸ The EU Commission stated that by July 2010, it will carry out an in-depth assessment of the situation of energy intensive industry and the risk of carbon leakage, in the light of the international negotiations and also taking into account any binding sectoral agreements. The report will be accompanied by any proposals or measures considered appropriate for compensation.

⁹ As far as we know, the Directive does not specify what happens with free allocation to industries if they chose to reduce production or migrate, and sell allowances in the market.

trade indicator relates the sum of traded goods to total market supply (the sum of domestic production and total imports of the sector under consideration).

Trade intensity = (total value of exports + value of imports) / (total turnover plus imports)

According to the Directive's formulations for the third trading period, an EU ETS sector is exposed to carbon leakage if it meets both the following conditions:

- The ETS implies an increase in production costs of at least 5%
- The industry has a trade intensity of at least 10%

Or, an EU ETS sector is also exposed to carbon leakage if it meets *one of* the following conditions:

- The ETS implies an increase in production costs of at least 30%
- The industry has a trade intensity of at least 30%

By end of 2009 and every five years thereafter, the EU Commission shall submit a list of the sectors or subsectors deemed to be exposed to a significant risk of carbon leakage. Work on the determination of exposed sectors has already started by analysing data in relation to the quantitative criteria on cost increase per gross value added and openness to trade. Recently the EU Commission published preliminary results on the individual criteria to be used.

3.4 Assessment of carbon costs by the Commission

The EU Commission analyses the effects of increased carbon costs on industry product cost structures by distinguishing between direct and indirect costs. Hereby, the basic approach taken is the concept of 'value at stake'. The maximum value at stake is defined as the sum of potential direct and indirect costs in relation to the GVA of a given industrial sector.

The direct carbon costs of an industry sector depend on the emission intensity of production. Direct emissions from combustions installations are taken from the CITL database based on fuel input and emission factors. Process emissions have been reported by the Member States to the Commission on request or derived from the countries' GHG inventories.

All sector relevant data has been matched with the categories corresponding to the NACE-4 sectors. If data could not be attributed to a sector at NACE-4 level, an attribution at NACE-3 has been made.

In its latest stakeholder meeting on the subject of carbon leakage¹⁰, the EU Commission suggested that indirect costs are calculated by using Electricity consumption data for each sector reported by the Member States. An average EU-27 emission factor is applied to get CO₂ indirect emissions. The data aggregates for average electricity consumption over GVA are received from Eurostat, but are mostly confidential. The assumed pass-through rate of the costs of CO₂ to electricity prices is not stated. Hence, it might be interpreted that the Commission suggests to apply the same indirect cost for all MWh consumed regardless in which Member State, but take into account differences in electricity intensity among industries and countries. To calculate the indirect CO₂ cost, the Commission would then use the same emission factor per MWh for all countries (average EU-27 emission factor).

This approach guarantees that all countries are treated equally. However, using the European average instead of the marginal emission factor, and allocating some allowances according to the indirect emission factor, may also result in an underestimation of the actual pass-through rate.

The Commission concludes its preliminary assessment regarding the direct and indirect carbon costs as follows:

1. Three sectors are above 30% CO₂ cost with respect to GVA:
 - a. Coke Oven products
 - b. Cement production
 - c. Lime production

2. Seven additional sectors are above 5% CO₂ cost with respect to GVA:
 - d. Manufacture of paper and paperboard
 - e. Manufacture of bricks, tiles and construction products, in backed clay
 - f. Manufacture of refined petroleum products
 - g. Manufacture of flat glass
 - h. Manufacture of hollow glass
 - i. Manufacture of basic iron and steel and of ferro-alloys
 - j. Aluminium products

The sectors with CO₂ costs above 30% represent about 10% of the emissions covered by the EU ETS in 2005, and the sectors with CO₂ costs above 5% represent 33% of industries covered by the EU ETS in 2005.

In general, it must be kept in mind that the above described assessment of carbon costs by the EU Commission assumes full auctioning of emissions allowances. So, the estimated direct cost levels do present the

¹⁰ The Commission hold its latest stakeholder meeting in 29 April 2009, in which the stakeholders (Member States, industry, NGOs and academics) were given the opportunity to present their views. The consultations usually take place in the framework of the Working Group on the review of the EU emissions trading scheme (EU ETS), set up in the context of the European Climate Change Programme (ECCP). http://ec.europa.eu/environment/climat/emission/carbon_en.htm

theoretical maximum value. Direct costs could be lower if part or all of the allowances were allocated for free, suggested in the Directive, depending on whether, and to what extent, the concept of opportunity costs is applied.

So, using 100% auctioning as the basis in the EU Commission's carbon leakage analysis does not fully reflect the text of the Directive, where the default level of free allocation to industry is declining from 80–30% over 2013–2020 rather than being 100% from 2013. However, using full auctioning would reflect the Directive's overall aim to avoid the risk of carbon leakage. Therefore, the EU Commission suggests to take into account the full carbon costs for the "carbon leakage industries" until the real benchmarks, which will be the basis for free allocation, are defined. Therefore, most likely, not all the above sectors will finally qualify for meeting the certain condition of exposure to risk of carbon leakage regarding carbon direct costs.

Assessment of trade intensity

The EU Commission has evaluated the trade intensities for the identified industrial sectors in retrospect mainly using data from for the year 2005 and 2007.^{11, 12}

In total, the Commission has assessed 231 sectors out of 258 NACE-4 sectors covering mining, quarrying and manufacturing. The trade intensity could not be calculated due to lack of data for 16 sectors (15 with no trade and 1 with no turnover). An additional 11 Sectors need to be further analyzed in detail.

Of the 231 assessed sectors, 43 sectors show a trade intensity which is smaller than 10%, 134 have a trade intensity higher than 30% and 54 sectors a trade intensity between 10 and 30%.

The most trade exposed ETS sectors are the production of precious metals (82%) and non ferrous metals (80%), the manufacture of other organic basic chemicals (61%), the manufacture of ceramic and glass products (49%), manufacture of pulp (46%) and aluminium production (37%).

However, these sectors show differences in the direct and indirect carbon costs. The aluminium sector indicates relatively high indirect carbon costs so that the total CO₂ costs per GVA are higher than 5%. In comparison, the other high trade intensive sectors are found to have relatively low indirect and direct carbon costs so that the total CO₂ costs per GVA are smaller than 5%.

¹¹ For the purpose of the EU ETS, the trade intensity is only calculated with countries outside of the EU (non-EU), as all EU countries take part in the Emissions Trading Scheme. For this reason, the trade intensity indicator relates the sum of exports into and imports from this region of non-EU countries to total market supply for the sector under consideration (sum of turnover and all imports of this product), indicated by the indices in the above equation for trade intensity.

¹² Import and export data is taken from COMEXT, Production sold from PRODCOM, turnover data originates from the SBAS database.

Based on the EU Commission's definition of exposure to carbon leakage (trade intensity > 10% *and* Carbon costs/GVA > 5% *or* trade intensity > 30% *or* Carbon cost/GVA > 30%) the Commission concluded that the following sectors meet one of these criteria with a very high likelihood (Table 4):

Table 4: Sectors classified as being exposed to risk of carbon leakage according to the EU Commission's preliminary assessment

Trade intensity higher than 30%:	Production of precious metals & non-ferrous metals, Manufacture of pulp, Manufacture other organic basic chemicals, Manufacture of ceramic and glass products, Aluminium production
Carbon costs/GVA higher than 30%:	Coke oven products, Cement and lime production
Trade intensity higher than 10% and carbon costs/GVA higher than 5%:	Manufacture of paper & paperboard, Manufacture of basic iron and steel, Glass manufacture, Refined petroleum products

The above described assessment has to be considered as very preliminary. The EU Commission's tentative timetable for the main steps with respect to the provisions on carbon leakage indicates that a draft list of exposed sectors or sub-sectors should have been published in June 2009. However, the draft decision on "(...) a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage" was not published until September, after the analysis in this report had been carried out.¹³ Therefore, the above calculations do not fully reflect the new list from the Commission. Nevertheless, in the following, the main arguments and results from the Commission's publication are presented.

The EU Commission determines the sectors or subsectors deemed to be exposed to a significant risk of carbon leakage in accordance with Article 10a (15) of Directive 2003/87/EC. The assessment is based on the average carbon price according to the Commission's impact assessment¹⁴, and trade, production and value added data from the three most recent years for each sector or subsector. The assumed carbon price including Joint Implementation and Clean Development Mechanism credits has been estimated to EUR 30 per tonne of CO₂ equivalent. The assessment of indirect cost was based on the Community average emission factor for electricity of 0.465 tonnes of CO₂ per MWh.

According to the recently published list, the following sectors are deemed to be exposed to a significant risk of carbon leakage:

¹³ Draft Commission decision of determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage. C(2009) xxx, http://ec.europa.eu/environment/climat/emission/pdf/draft_dec_carbon_leakage_list16sep.pdf

¹⁴ http://ec.europa.eu/energy/climate_actions/doc/2008_res_ia_en.pdf

Table 5: Sectors classified as being exposed to risk of carbon leakage by the EU Commission's draft decision from September 2009

Trade intensity higher than 30%:	Extraction of natural gas and crude petroleum products, Manufacture of pulp, Manufacture of other organic basic chemicals, Manufacture of textiles, Mining and quarrying
Carbon costs/GVA higher than 30%:	Cement and lime production
Trade intensity higher than 10% and carbon costs/GVA higher than 5%:	Manufacture of paper & paperboard, Manufacture of cast iron tubes, Glass and tiles manufacture, Refined petroleum products
Meeting all criteria regarding trade intensity and carbon costs	Mining of hard coal, chemical and fertilizer minerals, Manufacture of textiles Manufacture of coke oven products Manufacture of other inorganic and organic basic chemicals Manufacture of basic iron and steel and of ferro- alloys Aluminium production Copper production Other non-ferrous metal production

The above sectors and sub-sectors judged at risk of carbon leakage are not very different from the Commission's preliminary assessment described in Table 4. In total, these sectors are estimated by the EU Commission to account for around a quarter of total emissions covered by the EU ETS and around 77% of the total emissions from manufacturing industry in the EU ETS. Using the new list, the results for the Nordic countries would change slightly, although differently: In Denmark, the listed sectors would most likely account for 13%, in Finland 32% and in Sweden 59% of total emissions, if compared with emission figures from 2005 (see table 3). Here, Norway is difficult to estimate, since table 3 shows that 68% of Norway's emissions derive from power generation in the petroleum sector including refineries. Hence, all remaining industrial sectors cover 32% of the total emissions. This means that the sectors exposed to risk for carbon leakage would account for at least 32% of emissions in Norway, but probably more since some refineries classified in the power sector will be also exposed to carbon leakage. If the EU Commission implements their suggestions and apply 100% free allocation to the above listed industrial sectors, the Nordic countries's industry sectors, and most significantly the Swedish industry, will hardly receive any allocation via auctioning.

The Commission's draft Decision will now undergo three months of scrutiny by the European Parliament and the Council with a view to its adoption by the Commission by the end of this year.

In addition to the above described quantitative criteria on carbon leakage the Directive contains qualitative criteria. The qualitative assessment

will concern those sectors which do not fulfil the quantitative criteria. Such a qualitative assessment goes beyond the scope of this project.

3.5 Impact on Nordic allocation volumes

Following the EU Commission’s preliminary assessment and its draft decision on carbon leakage, nearly all EU ETS industrial sectors will most likely meet the criteria to get free allocation. These sectors are metal production, aluminium production, pulp and paper manufacturing, glass and ceramic manufacturing, production of basic chemicals, refined petroleum products and the cement and lime production.

If a sector is defined as being significantly exposed to carbon leakage, it will get 100% free allocation instead of 60% (declining to 30% in 2020) assumed in the Base Scenario. Depending on the sector’s share of the overall scheme’s emissions, the higher share of free allocation reduces the overall EU-wide auctioning volume, since the total allocation volume (issued allowances) stays constant.

Figure 11 shows the free allocation volumes and auctioning volumes for the Base Scenario (full bars in the Figure 11) and for the case that all the above mentioned sectors, except of aviation, receive free allocation because they meet the EU Commission’s criteria for being exposed the risk of carbon leakage (striped bars in Figure 11).

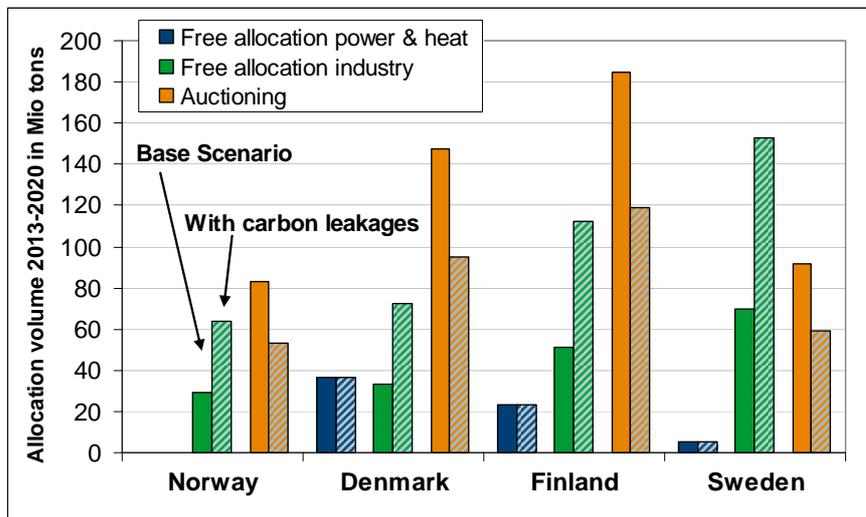


Figure 11: Auctioning and free allocation volumes for the Nordic countries including carbon leakage, compared to the Base Scenario

In general, the resulting increase in free allocation to industrial sectors at the risk of carbon leakage reduces the auctioning volume by about 35% on an EU wide level as well as for the Nordic countries. Among the Nordic countries the overall impact of increasing free allocation to industries exposed to carbon leakage is most significant for Denmark and Sweden,

although with opposite effects. The total allocation to Denmark, i.e. the auctioning volume plus the free allocation to industries, is reduced by 7.5 million t/a when all industry sectors are classified as “carbon leakage industries”. In other words, the increase in the free allocation is less than the reduction in the auctioning volume. The other Nordic countries receive a higher additional free allocation amount than the reduction of their auctioning volume. For Sweden the net gain is 54 million t/a, whereas net gains for Finland and Norway are at 2.5 and 8.3 million t/a respectively.

As seen from Figure 11, the calculated free allocation volume to industry is very sensitive to the assumptions for the sector’s exposure to the risk of carbon leakage. This sensitivity is mostly affected by the industrial structure of the Nordic countries. If a country has relatively much industrial emissions and especially from sectors classified as at risk for carbon leakage this means a higher amount of free allowances as for countries with sectors mainly in the auctioning category (power production), which is the case in Denmark.

3.6 Carbon leakage and the Nordic countries

Measures to address carbon leakage

There are several options to deal with distortions in competitiveness and carbon leakage. Policy instruments include three main type of measures to address carbon leakage: Measures that directly soften the regulative impact of the emissions trading scheme for sectors exposed to carbon leakage (e.g. adapted trading rules or state aid); measures that adjust the CO₂-related costs for products at the border or that limit domestic market entry to foreign products if the latter do not meet specific requirements (Border tax adjustments); and measures that attempt to engage specific sectors in non carbon constrained countries (sectoral and/or voluntary agreements).

In the Directive, the EU Commission address carbon leakage by means of the first type of measures, dealing with distortions in competitiveness and carbon leakage by reducing the cost implications of the ETS for industries exposed to international competition. Such compensation is to be given as free allocation to the exposed industries, to compensate the direct costs of the ETS, plus a provision is made to account for the indirect costs incurred from increased electricity prices.

As outlined above, industries which are classified as exposed to carbon leakage will receive free allocation of allowances according to EU-specific benchmarks. There is no option for individual member states to adopt different, country-specific rules for the allocation of allowances to

ETS industries: The free allocation will be managed by the EU according to common rules.

When it comes to the effects of indirect carbon costs (e.g. from electricity prices), the EU ETS directive allows Member States to additionally apply “compensation with respect to costs”.

This is what is stated in the Directive:

“Member States may also adopt financial measures in favour of sectors or sub-sectors determined to be exposed to a significant risk of carbon leakage due to costs relating to greenhouse gas emissions passed on in electricity prices, in order to compensate for those costs and where such financial measures are in accordance with state aid rules applicable and to be adopted in this area. Those measures shall be based on ex-ante benchmarks of the indirect emissions of CO₂ per unit of production. The ex-ante benchmarks shall be calculated for a given sector or sub-sector as the product of the electricity consumption per unit of production corresponding to the most efficient available technologies and of the CO₂ emissions of the relevant European electricity production mix.”

The Directive does not specify the “compensation”, “benchmarks“, or “relevant European electricity production mix” further. More detail on how such compensation may be designed should be expected from the EU Commission by the end of 2009. It seems however clear that even the compensation for indirect cost, although given by Member States, is to follow common EU rules and benchmarks, which are yet to be decided.

Impacts of carbon leakage

The measures adopted may not be sufficient to mitigate carbon leakage. Competitiveness is determined by the marginal costs of production, which includes the opportunity costs of carbon, independently of the amount of allowances companies receive for free. Hence, it may still be profitable for companies to relocate production and sell allowances in the market instead of using them for own compliance. Presumably, however, free allocation is going to be monitored closely and will not be applicable to idle production. The more the adjustment in free allocation provisions is lagged compared to actual production, the less potent is free allocation in terms of mitigating carbon leakage.

Older installations with higher emissions than the adopted benchmark will still be exposed to the cost of buying allowances. Such industry installations will move outwards in the industry merit order curve, and may be closed earlier than similar industry installations elsewhere in the world. This could particularly be the case in industries which are at a decline globally, or already struggle with global excess capacity, as e.g. parts of the pulp and paper industry.

When it comes to investments in new industry plant, free allocation should mitigate carbon leakage, as it must be expected that new installations

will employ state-of-the art technology, including energy efficiency and emission intensity, in accordance with the adopted benchmarks anyway.

The compensation for indirect costs, i.e. the pass-through of carbon costs in electricity prices, may be as important as free allocation for the exposed industries. Many of the ETS industries are indeed very energy intensive, and electricity costs account for a large share of the costs for much of the Finish, Norwegian and Swedish ETS industries. Therefore, correct compensation for indirect costs may be particularly vital for these countries.

The pass-through of ETS costs in electricity prices vary between Member States. The actual pass through rate of CO₂ costs to electricity prices varies a lot among different Member States. The differences in cost pass-through depend on the specific energy mix and the resulting merit order in each country, i.e. the increase in (average) marginal costs of electricity generation. Hence, a European average carbon factor will not represent a correct estimate. However, the pass-through also depends on electricity exchange between countries, so country-specific pass-through rates based on the national generation mix would not be correct either.

In the Nordic countries average emission factors of electricity generation are generally much lower than the European average due to the high share of renewable energy sources, although the pass-through in marginal costs may be as high or even higher. If a European average is applied, the indirect cost would be underestimated for some countries and overestimated for others. Nordic industrial sectors will benefit from this compared to other countries if their exposure to carbon costs via electricity prices is smaller than the European average, and be undercompensated if the opposite is the case. On the other hand, using national averages would mean that the Norwegian carbon factor would be zero, the Swedish factor would be low, the Finnish factor probably lower than the European average, and the Danish factor higher. Electricity prices in the Nordic area are however closely related due the common electricity market and strong interconnections between the countries. Hence, there is for example clearly a pass-through of carbon costs in Norwegian electricity prices although Norwegian electricity generation, regarded in isolation, is virtually emission-free.

For the Nordic ETS industries it is of special interest that the compensation for indirect cost is calculated in a manner that takes full account of the actual pass-through of carbon costs in Nordic electricity prices. As shown above, emission factors based on a European average may underestimate actual pass-through effects, and emission factors based on average national emission factors would substantially underestimate indirect costs, particularly for Norway and Sweden.¹⁵

¹⁵ It is of course not an easy task to correctly calculate the pass-through of carbon costs in power prices as wind conditions and precipitation, as well as economic conditions and fuel prices vary substantially over time. Such calculations are well beyond the scope of this project.

It may be noted that financial compensation for indirect costs would not fall under the criteria of revenue recycling as described in chapter 4. Hence, additional financial resources are required.

Overall, carbon leakage is likely to increase global emissions since industries and/or production move to locations where they are not exposed to carbon costs. Hence, the incentives for “emission efficiency” in operation and investments would be weaker.

In terms of competitiveness to non-european industries, an expected new international post-Kyoto agreement may lead to a situation which would require adjustments of the sector’s compensation or no longer require compensatory measures for the exposed sectors. This might be the main reason, why the EU Commission will first publish specified rules on carbon leakage at the end of this year, after the 15th UNFCCC Conference of the Parties has been taken place.

An international post Kyoto agreement with more countries taking on binding commitments, or implying global sectoral frameworks, may lead to adjustments in the status of sectors as exposed to carbon leakage. The prospects of such an agreement may also mitigate industry companies’ eagerness to invest in other locations as a way of avoiding the ETS costs as well.

3.7 Sensitivity analysis on Nordic free allocation volumes

The calculated free allocation volumes are very much afflicted with uncertainties. Mainly because some regulations on the future allocation rules are not yet defined and/or quantified.

Furthermore, differences in the industry structure and industrial sectors’ emission shares influence the Nordic countries free allocation volumes and hereby its sensitivities to the different assumptions regarding the allocation rules. In the following, the sensitivities of the calculated free allocation volumes are assessed.

Assessment of sensitivities on main assumptions

In order to assess the impact of changing the Base Scenario assumptions on the total auctioning volume, a simple sensitivity analysis has been made, assessing the impact of changing each of the following assumptions: the share of leftovers from the new entrant reserve being auctioned, the share of small installations which are opted out, and the share of heat production which qualifies for the free allocation.

To assess the sensitivity of the free allocation and auctioning volumes, we have analyzed the Base Scenario with changed assumptions. In Table 2, the quantitative changes can be seen for the following parameters: free allocation to industry, free allocation to high efficient heat production,

opt-out of small installations and the utilization of the NER. The implications of changing the four parameters have been analyzed and are described in the following.

Denmark is most sensitive in terms of the auctioning volume deriving from the NER. This is because Denmark has the highest relative share of auctioning compared to its overall allocation volume. And impacts on the Europeanwide auctioning volume will most impact the countries with a higher auctioning share of its total allocation volume.

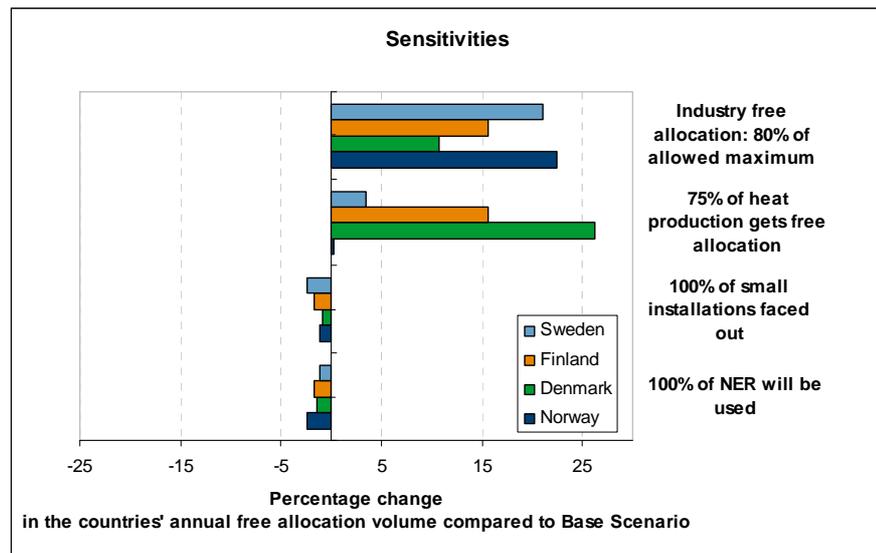


Figure 12: Sensitivities of assumptions on the free allocation to the Nordic countries

Figure 12 shows the changes in the free allocation volumes for industry and the power and heat sector depending on the different sensitivity cases described in Table 2.

The graph depicts percentage changes in the free allocation volume, compared to the base scenario’s total free allocation volume. The sensitivities of 4 different input parameters have been investigated:

1. The free allocation share for the industry
2. Free allocation for heat generation
3. Opt out of small installations
4. Utilization of the New Entrants Reserve

The assumption on each parameter has been changed individually, leaving the remaining parameters unchanged (at the Base Scenario value). Negative percentages indicate a reduction in the free allocation volume whereas positive percentages show an increase in the countries’ overall free allocation volume. It needs to be kept in mind that the absolute emission and allocation volumes differ strongly from country to country. Hence, the same relative change may present different absolute volumes of the countries’ total free allocation and indicate different significances.

The results show that the free allocation volumes are most sensitive for the free allocation share for the industry allocation and the heat generation. Hereby, the increase in the share of CHP installations which qualify for free allocation to heat generation increases the free allocation volume for the power and heat sector. Denmark is the most sensitive in regard to this parameter and increases its total free allocation volume by 18 mio tons, once 75% of all heat generation receives free allocation. Finland increases its free allocation by 12 million t/a, whereas Sweden only increases by 3 million t/a and Norway by less than 1 million t/a. A reason for the high impact on Danish and Finish free allocation volumes is that these countries have a relatively high share of emissions deriving from heat generation. In Denmark, 47% of its emissions from combustion installations derive from heat generation. In Finland, heat holds a share of 33%. Sweden only has 20% of its emissions from combustion installations deriving from heat and Norway less than 1%.

The opt-out of small installations has the highest impact on the Swedish allocation volume. That is because Swedish installations emitting less than 25 000 million t/a represent about 7% of the total country's ETS emission volume. In Denmark and Finland this share is only 5%, and in Norway 3%.

Assessment on sensitivities regarding carbon leakage

As already described above, the calculated free allocation volumes to industry are especially very sensitive to the assumptions for the sector's exposure to the risk of carbon leakage. And hereby, the industrial structure of the Nordic countries affects this sensitivity. If a country has relatively much industrial emissions and especially from sectors classified as at risk for carbon leakage this means a higher amount of free allowances as for countries with sectors mainly in the auctioning category (power production).

The assessment of free allocation to Nordic industries is based on the preliminary list of "carbon leakage industries" from the EU Commission. The sensitivity of changes in the list of exposed sectors on the Nordic countries free allocation volumes (2013–2020) is depicted in Figure 13.

The Base scenario builds the basis for comparison. Here, no sector is classified as being exposed to any risk for carbon leakage. Each bar in the graph below shows the absolute increase in the average annual free allocation volume once the appropriate sector is categorized as exposed to risk of carbon leakage and therefore receives 100% free allocation.

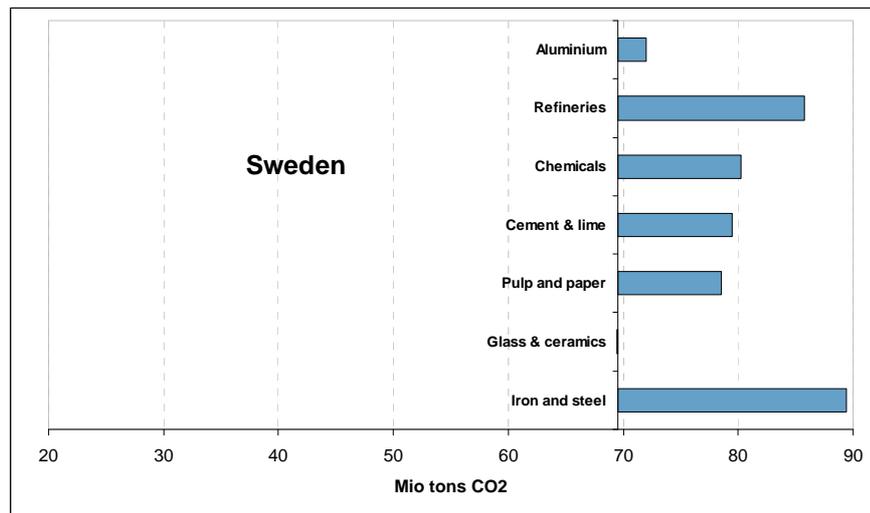
In terms of potential allocation volumes, the refinery sector is significant in all the Nordic countries. If this sector receives free allocation, the total free allocation volume of Sweden would increase by about 15 million t/a, in Finland it would show an increase of 10 million t/a, in Norway

it would show an increase of 9 million t/a and in Denmark it would show an increase of 2 million t/a.

At the other end of the scale is the glass, brick and ceramic sector for which the potential free allocation volume is small for all Nordic countries. Such production installations are hardly present or do not represent a significant emission source within the Nordics.

For Sweden and Finland, the highest potential free volume of allowances would be allocated to the iron, steel and metal industry. Total free allocation volumes increase by 20 million t/a in Sweden and by 23 million t/a in Finland when these industrial sectors are included. This increase represents about 45% of the Finish total free allocation volume to industry, and about 30% of the Swedish volume.

In Denmark, the cement and lime sector plays an important role. If this sector would receive free allocation, the Danish total free allocation volume increases by 15 million t/a, nearly 50% of the country’s total free allocation to industry. Also Finland and Norway has a significant potential free allocation volume associated with the cement and lime sector. Each country’s total allocation volume would increase by about 6 million t/a if this sector receives free allocation. Sweden’s free allocation to cement and lime installations would increase by about 10 million t/a. However, for Norway, the aluminium sector is the most important sector which may be exposed to carbon leakage. The total free allocation volume for Norway would increase by 11 Mio t/a, 38%, if the aluminium sector receives free allowances.



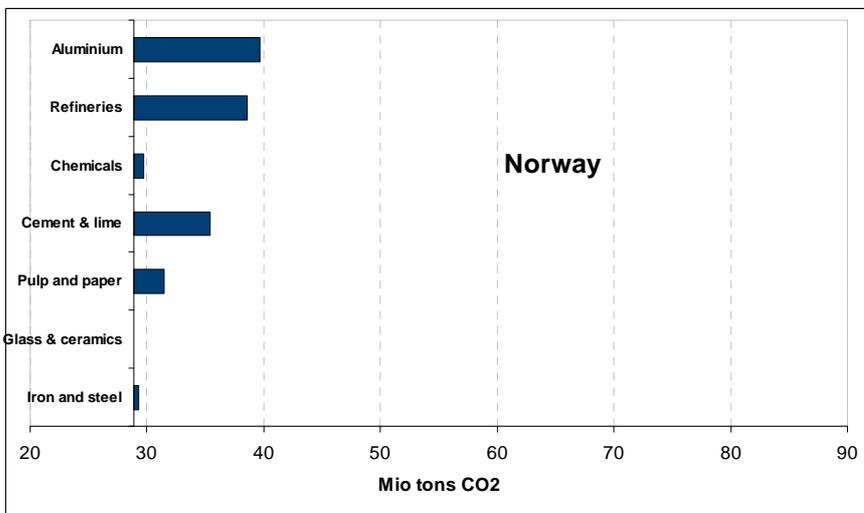
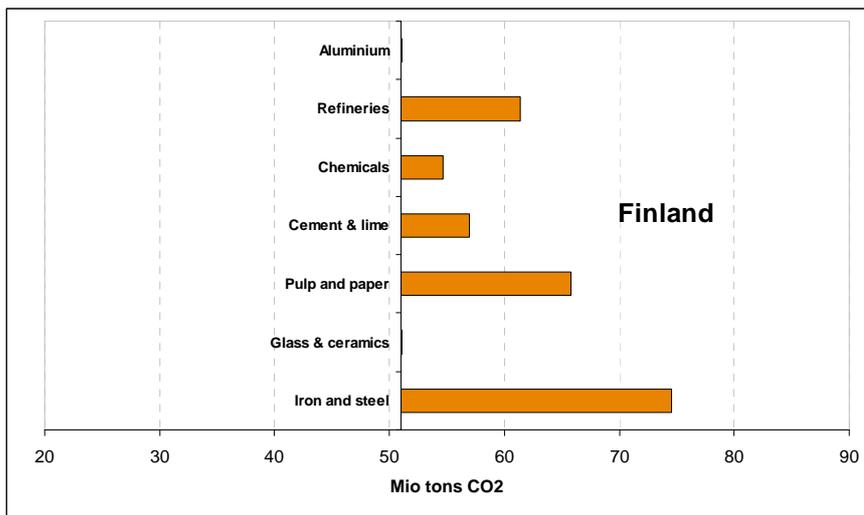
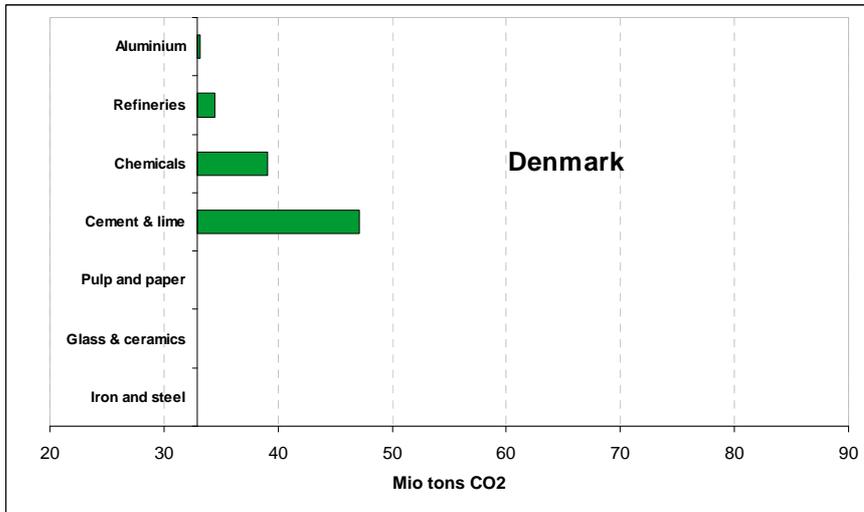


Figure 13: Sensitivities on free allocation volumes once certain sectors show risk for carbon leakage

4. Recycling of auction revenues

The main purpose of the EU ETS is to create an economic incentive to restructure energy production and shift consumption away from carbon-intensive products. This is believed to be beneficial for the society in the long run by mitigating climate change.

The ETS achieves this effect by putting a cost on emissions, thereby internalizing the environmental cost of emissions. This means that the products of industries which emit greenhouse gases (GHG) become more expensive and products with low or no associated GHG emissions become relatively cheaper. Although on the whole, the carbon cost reduces economic growth (as shown by e.g. the so-called Stern review, Stern (2007)¹⁶), this loss is perceived to be lower than the costs of climate change in the long run.

Trading in emission allowances may be compared to a Pigouvian tax: Instead of using an estimate of the marginal damage cost at the efficient level of output¹⁷, the optimal emission level is estimated, and the marginal abatement cost determines the implicit tax level.

Although there is some criticism of the Stern report's estimates of abatement and climate costs (see Nordhaus, 2007)¹⁸, we will regard the implicit tax on emissions as a correctional tax in the following analysis. This means that we regard the CO₂ tax as internalization of a negative externality, and as such, a tax that improves social welfare, in line with the argument of the Stern report.

The argument from the Stern report requires however that climate change mitigation is carried out cost efficiently, i.e. by incentivizing the most cost effective abatement measures, and without excessive administrative or tax related burdens on the economies. The EU ETS must be regarded as an efficient means of abating carbon emissions: all installations included in the ETS face the same cost of emissions and scarcity of allowances (the cap) and the free trading opportunity ensures efficiency. The emission reduction target goes beyond the ETS, however, and non-ETS sectors and non-EU countries probably are likely to face different marginal abatement costs.

As explained in chapter 2, the total EU auctioning volume is going to be allocated among the national governments participating in the ETS.

¹⁶ Report presented by Sir Nicholas Stern, Head of the Government Economic Service and Adviser to the Government on the economics of climate change and development, to the UK Prime Minister and the Chancellor of the Exchequer on the Economics of Climate Change, in October 2006.

¹⁷ See e.g. Rosen (1995) for the definition of a Pigouvian tax.

¹⁸ One of Nordhaus' main criticisms of the Stern report is that the applied discount rate is too low. This relates to the problem of comparing costs of today with benefits accruing in a fairly distant future.

Hence, in the same way as a Pigouvian tax, auctioning of emission allowances creates new revenues for the state treasuries. According to the Directive, Member States are free to determine how to use these funds, but it is recommended that at least half of the revenues are used to combat climate change, or that Member States have in place an equivalent amount of fiscal or financial support for such purposes.

The Directive recommends that at least 50% of the auctioning revenues be used for one or several of the following objectives:

- Reduce greenhouse gas emissions
- Facilitate adaptation to the impacts of climate change
- Develop renewable energy sources
- Finance research and development in energy efficiency and clean technologies
- Capture and geological storage of greenhouse gases
- Avoid deforestation, increase afforestation and reforestation, particularly in Least Developed Countries
- Forestry sequestration in the EU
- Encourage shift to low emission or public transport
- Increase energy efficiency and insulation, particularly in low or middle income households
- Cover administrative expenses of the management of the Community scheme.

In addition, the proceeds from auctioning 300 million allowances from the new entrants reserve will be earmarked for support to up to 12 carbon capture and storage demonstration projects and projects demonstrating innovative renewable energy technologies.

The purpose of this section is to analyze the effect that the auctioning revenues can have on the Nordic economies:

- To identify and discuss possible benefits and drawbacks of earmarking versus alternative ways of recycling the allowance auctioning revenues to the economy.
- To relate the current Nordic spendings on climate related purposes to EU's recommendation for earmarking. If the climate related spendings are already higher than the recommended earmarking volume, we will argue that the Directive's recommendation will not introduce any additional inflexibility in the Nordic countries' budgets.

4.1 Recycling schemes

The auctioning revenues can be used in different ways:

1. They can be used to reduce other (distortionary) taxes
2. They can be used to increase the state budget and thereby finance new public activities at the discretion of politicians
3. They can be earmarked for specific purposes

Reduction of distortionary taxes

The auctioning revenues give the opportunity to reduce the social cost of taxation by recycling these funds to the economy, such that the total tax burden on the economy remains the same. Assuming that the total tax burden is already optimal in view of the social benefits of public spending and the total costs of taxation, this option would be the one recommended by economists.

There are generally two types of welfare loss associated with taxation: one is the distortion of economic activity, creating an excess burden, and the other the cost of tax collection itself. The distortionary effect is e.g. to shift the trade-off between leisure and work induced by income taxes, or the trade-off between consumption and savings induced by VAT taxation. It is generally not possible to raise tax revenues without creating efficiency losses. The exception is taxation of negative external effects such as environmental damage, where the purpose of the taxation is to correct the trade-offs in the presence of social costs which are not taken into account by the market actors, such as the implicit carbon tax created by the ETS.

Increased public spending

As the ETS auctioning revenues increase the share of correctional taxation in the total tax base, the effect should be to reduce the marginal social cost of taxation, thereby creating a basis for increased public spending. From an efficiency point of view, however, the increased spending should be directed to the sectors and activities which are deemed by politicians to create the largest marginal benefit. This could be activities related to combat of climate change, but could also be funding of other activities.

The EU ETS is not the only climate policy instrument used by Member States. Indeed, Member States also have emission reduction targets related to the non-ETS sectors. The spending on different climate policy related issues and the marginal abatement costs related to the domestic measures taken in these sectors will differ from Member State to Member State. Hence, it may be optimal for some of the Member States to in-

crease the spending on such measures based on the auctioning revenue, and not for others.

Earmarking

Earmarking is generally disliked by economists, exactly because it is an inefficient way of allocating resources. On the other hand, earmarking may be useful in securing funds for a prioritized purpose such as climate combat, and to gain public acceptance for the price on carbon emissions.

Earmarking does not necessarily induce increased spending on climate related measures. As mentioned, the Member States already have national climate policy targets and emission reduction obligations for non-ETS sectors, and the public spending may already be as high, or higher, than the recommended 50% of revenues. In that case, earmarking of auctioning revenues would not imply any extra restraints on state budgets: The auctioning revenues may be sourced to climate policy issues, and the freed general budget funds may be allocated to other purposes in the state budgets or used for general tax reductions.

It should however be kept in mind that the relative share of emissions between ETS and non-ETS sectors vary between member states. I.e., Member States with a high share of the auctioning volume do not necessarily account for the same share of non-ETS allowances, or rather a corresponding share of abatement commitments.

Earmarking has been the subject of some debate in the economic literature, and below we present the main arguments of the proponents of earmarking and the opponents. Earmarking is also commonly used in practice, and we also present some examples of practical applications.

Advantages of earmarking

The main arguments used in favour of earmarking include:¹⁹

- Predictability of financing
- Efficient allocation
- Higher public acceptance

It is argued that earmarking gives a more predictable and stable level of financing for a specific purpose, regardless of changing priorities and governments. Predictability reduces uncertainty and is therefore expected to enhance long-term investments. In addition, earmarking may give a more efficient allocation of resources because periodic haggling over how much to spend is avoided. Again, this reduces the long-term uncertainty of public funding, and is beneficial for long-term investments and planning.

Last, but not least, earmarking may increase public acceptance of taxes because the taxpayers are ensured that the money is actually used

¹⁹ According to Müller (2008), Camic (2006) and McCleary (1991).

for a specific purpose and does not go into a “black hole” in the budget. For instance, if the taxpayers feel that the use of the tax revenues benefits them in a direct way, it will be much easier to gain acceptance. By creating a link between tax collection and spending, earmarking may thus make it possible to gain acceptance for a new tax where neither the additional spending nor tax collection would have any chance of being sanctioned on its own.

An obvious example of such earmarking is toll payment for new roads. It may also be easier to gain public acceptance for the “polluter-pays” principle if the tax collected is directly linked to the mitigation of the taxed negative effect. This may be especially important if the tax objects suspect that the taxation is not optimal, i.e. based on the marginal damage cost, but mainly geared at increasing general government spending.

Optimal Pigouvian taxes should in theory be set according to estimates of the marginal damage cost, taking into account the efficiency of taxation in general. This is not an easy task, and the somewhat academic concept of a marginal damage cost may be difficult to understand and accept by the general public. In contrast, the polluter pays principle relates the tax level to the perceived cost of mitigating the damage, which could be far easier to accept.

Disadvantages of earmarking

As explained above, earmarking of governmental funds is often considered to be in conflict with sound fiscal practice (Eskeland, 2005). The reason is first of all that the rationales for taxation and spending are widely different: Tax collection is targeted at raising revenue for government spending, but also to influence and direct market behaviour. Government spending is on the other hand directed at solving specific tasks of interest to the society and funding public goods. To ensure maximum efficiency, the government should spend the raised revenues in a way that creates the greatest benefit for society as a whole, without reference to how the revenues were collected.

Taking environmental taxes or cap-and-trade systems as an example, a price is set on consumption to induce the market players to pollute less. The public spending on environmental issues, on the other hand, is aimed at maintaining a clean environment. If there is a mismatch between the generated income and what is reasonable to spend on the environment, earmarking may cause inefficient use of revenues. This is especially so if the environmental taxes raise larger revenues than what is rational to spend on the environment.

While the intentions are usually good, earmarking may therefore give less flexibility to politicians to allocate funds in an efficient way. Earmarking also has the effect of pre-committing future governments or generations. In some cases, earmarking schemes may persist long after having served their original purpose.

Earmarking also pose challenges of a practical nature. In a constantly changing world it is usually difficult to arrive at an earmarking scheme that gives exactly the desired amount of revenues to the specified purpose. If the revenues raised from allowance auctions are smaller than desired, or decline with time because market behaviour changes and less fossil fuels are used (which is in fact the desired effect), additional climate funding may anyway have to be sanctioned. On the other hand, if the raised revenues are higher than the desired spending, in terms of the marginal benefit compared to the best alternative use, there is a risk that the additional funds are spent in an inefficient manner.

In summary, typical criticisms of earmarking include:

- Misallocations of resources, with too much being given to earmarked activities
- Hampering of effective budgetary control
- Infringement of legislative and executive power of government
- Introduction of inflexibility in budgets
- Reduced budgetary powers of the legislator (Parliament)

Earmarking practices

Despite allegations of being inefficient, there are plenty of examples of earmarking of Governmental revenue for special purposes, and often related to environmental issues. Earmarking of environmental excise taxes is usually associated with the polluter pays principle. One example is the International Oil Pollution Compensation Funds (IOPC Funds), which are part of an international regime of liability and compensation for oil pollution from tankers. The IOPC Funds are financed by levies on certain types of oil carried by sea. Another example is the so-called Superfund in the USA, which in 2007 collected 1 Billion USD for clean-up of sites contaminated by hazardous substances under the CERCLA Act.

Earmarking of environmental taxes has also been used or proposed to raise funds for climate change combat. In 2001, the UK government issued the Climate Change Levy (CCL), which is a tax on energy use aimed at increasing energy efficiency and reducing CO₂ emissions. A part of the revenue from the tax is earmarked for funding of a number of energy efficiency initiatives, including The Carbon Trust. In addition to helping increase businesses' energy efficiency and reduce carbon emissions, the Carbon Trust funds development and deployment of low-carbon and renewable energy sources. In its first three years, the trust received around £150 million from the CCL.

In Norway, a 1 øre/kWh tax on electricity use is earmarked to fund Enova, a public enterprise owned by Government (Ministry of Petroleum and Energy) established to promote an environmentally friendly transformation of energy use and production. In 2009, the Enova tax is expected to generate 740 million NOK for these purposes. In Denmark the

electricity price includes an electricity-saving fee (elsparebidrag) of 0.6 øre/kWh earmarked for energy saving measures through the Elsparefond-fund.

4.2 Nordic spending on climate abatement and mitigation

Figure 14 shows an overview of the budgeted expenses that fall into one of the recommended earmarking purposes (see Table 6). The numbers are taken from each of the countries' state budget for 2009. For Norway, the financial crisis package that was adopted in January 2009 is not included because these expenses are of an extraordinary nature. To get a better overview of the nature of the "normal" annual public spending on the proposed earmarking activities, the spendings have been coarsely categorized in the figure. For further details see next sections.

The numbers reflect different budgeting practices and systems in the Nordic countries and are therefore difficult to compare directly. There may be "hidden" spendings on climate that are difficult to extract from the budgets. For instance, all countries state that climate is an important or prioritized area for their Foreign Aid spending, but these spendings are rarely explicitly identified or quantified in the budgets.

On the other hand, some of the spendings are not funded through taxation and can therefore not be regarded as public spending or counted as a part of the total earmarked spendings. This is for instance the case for a large part of Sweden's spendings on renewable energy, which is funded by direct payments from electricity end-users through the Electricity Certificate market.

In figure 14, energy research budgets have been included as long as they are not specifically linked to the petroleum industry (mainly Norway). In some cases, the numbers may however still include research on fossil energy sources which is not climate related. Energy Research funded through the EU Framework Programs is not included.

Despite these shortcomings, the quoted numbers are still assumed to give a broad overview of the magnitude of resources already spent on climate combat. The numbers can be seen as a conservative estimate of expenses that can be defined to fall under the Directive's recommendations for earmarking. Table 6 gives an overview of how the categories in figure 13 relates to the various purposes listed in the Directive.

If these costs exceed the amount of auctioning revenues recommended to fight climate change, we will argue that no further spending will be needed to fulfil the provisions of the Directive with respect to earmarking (Article 10, 3):

Member States shall be deemed to have fulfilled the provisions of this paragraph if they have in place and implement fiscal or financial support policies, including in particular in developing countries, or domestic regulatory policies, which leverage financial support, established for the purposes set out in the first subparagraph and which have a value equivalent to at least 50% of the revenues generated from the auctioning of allowances (.....)

Table 6: Mapping of Directive’s earmarking purposes (Article 10, 3) to categories in Figure 14

Article 10,3 sub-point	Purpose (Directive’s wording)	Category (See figure 14)
a)	Reduce greenhouse gas emissions, adapt to the impacts of climate change	Climate adaption and reduced emissions
a)	To fund research and development for reducing emissions and adaptation to climate change	Research
b)	To develop renewable energies to meet the Union’s commitment to using 20% renewable energies and to increase energy efficiency by 20% by 2020	Renewables and energy efficiency
c)	Measures to avoid deforestation and facilitate adaptation to climate change in developing countries	International Measures
d)	Forestry sequestration in the Community	Climate adaption and reduced emissions
e)	To provide for the environmentally safe capture and geological storage of greenhouse gases	Various
f)	Encourage a shift to low-emission and public forms of transport	Public and low emissions transport
g)	Finance research and development in energy efficiency and clean technologies	Research
h)	increase energy efficiency and insulation, address social aspects in lower and middle income households	Renewables and energy efficiency
i)	Cover administrative expenses of the management of the Community scheme.	Various

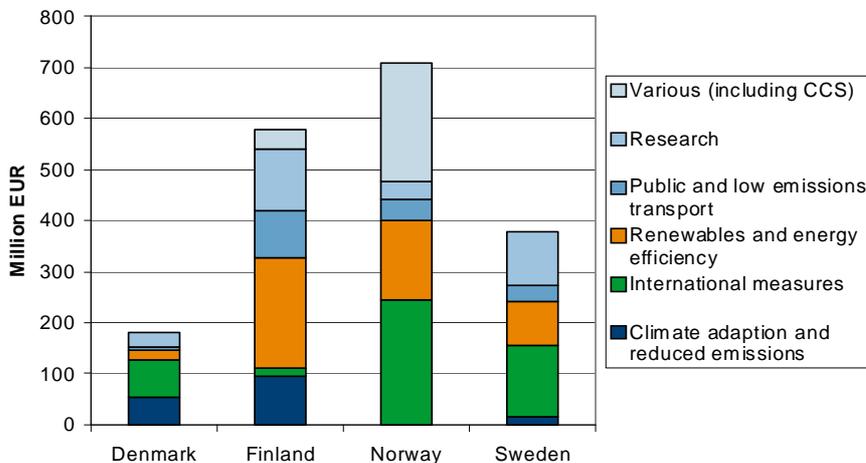


Figure 14: Nordic countries’ expected spending on climate combat in 2009

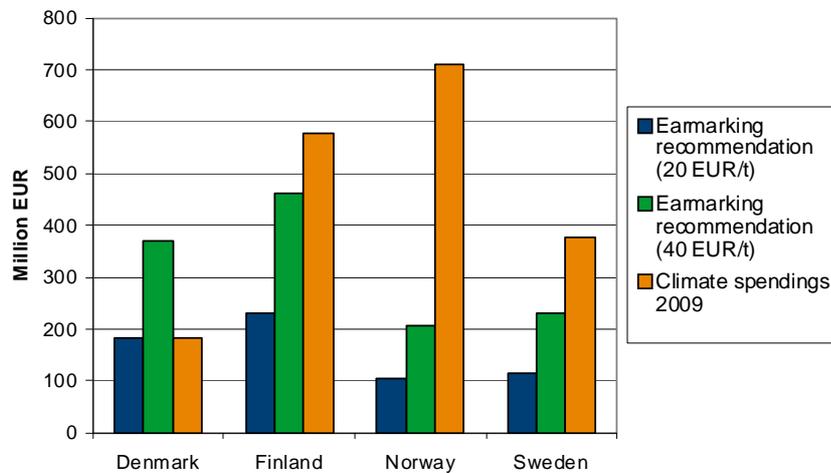


Figure 15: Expected annual earmarking volume (average 20012–2020 calculated for carbon prices of 20 and 40 €/ton) in relation to 2009 climate spendings in the Nordic countries

Figure 15 shows an overview of the estimated amount recommended for earmarking for a respectively low and high carbon price, and also the budgeted climate spending of each of the Nordic countries for 2009. The estimated amounts are based on auctioning volumes in the Base scenario, i.e. the maximum auctioning scenario. If the earmarking provision is not binding for the Nordic countries in this scenario, it is not binding in the other scenarios where a smaller amount of allowances are auctioned.

In the following, the climate related Nordic budgets for 2009 are further detailed.

Denmark

During the last decades, Denmark has been very successful in promoting the deployment of small scale renewable energy and natural gas based CHP (‘prioritised production’). The main political instruments that have been used are feed-in systems, political obligations, investment subsidies and tax refunds.

Since 1993 a feed-in tariff system existed in Denmark, where utilities were obliged to pay wind turbine owners up to 85% of the electricity price for household consumers. In 1999 the Danish Government proposed a renewable electricity certificate (‘VE-bevis’) system with a 20% purchase obligation for all consumers.²⁰ The green certificate market was supposed to replace the existing feed-in system from January 2003. However, the introduction of such a green certificate system has been postponed indefinitely due to concerns from the renewable energy sector about the market for green certificates, especially in the European context.

²⁰ <http://www.ens.dk/sw13373.asp>

As a response to the European Commission's Energy and Climate package for 2020 the Danish Parliament adopted the Danish energy policy for the years 2008–2011 in February 2008.²¹ This political agreement will play an important role for the development in the Danish energy mix in the coming years.

The energy policy agreement contains targets for improved energy efficiency, reduced gross energy consumption and more energy effective buildings. The EU RES Directive sets a target for 30% use of renewable energy for Denmark in 2020. This target is to be reached through increased subsidies for biomass based CHP, biogas fired plants and wind power. In addition to this, the CO₂ tax on fossil energy use is raised to the expected level of the CO₂ quotas.

At present feed in tariffs (a guaranteed fixed price per kWh for a specific period of time) are used as the general support measure towards renewable energy in power production.

In their 2009 Foreign Aid Budget, Denmark has allocated 458 million DKK to Environmental and Climate aid. In addition, around 115 million DKK are set aside for CO₂ credit purchase and environmental aid to East Europe, the Arctic area and Developing Countries on the Energy and Climate budget (Table 7). The budget for Energy Research, which is mainly allocated through the EUDP programme, is set to 226.5 million DKK. Around 150 million DKK is set aside for exploitation of renewable energy and energy efficiency. Of this 10 million DKK are allocated to research on electrical cars. In the budget of the Ministry of Transport, 21 million DKK are accounted for the support of energy friendly technologies and biofuels. 400 million DKK are set aside for limiting CO₂ emissions, of which most are grants to combined heat and power production as well as to specific industry sectors.

²¹ Energistyrelsen, "Aftale mellem regeringen (Venstre og Det Konservative Folkeparti), Socialdemokraterne, Dansk Folkeparti, Socialistisk Folkeparti, Det Radikale Venstre og Ny Alliance om den danske energi-politik i årene 2008–2011", 21. Februar 2008.

Table 7: Climate related spending, Denmark (million DKK)

Denmark's governmental spending on climate relevant areas – 2009 (million DKK)		
Ministry for Environment	Purchase of CO2 credits and support to eastern EU	3.9
Ministry for Transport	Energy friendly technologies & biofuels in transportation	21
Ministry of Foreign Affairs	Environmental & climate assistance to developing countries	457.8
Ministry for Climate and Energy	<i>Renewable energies and energy efficiency</i>	
	Energy efficiency fund (elsparfund)	93.5
	Utilisation of heat pumps	15.5
	Energy efficiency measures in buildings	20.7
	Research on electricity cars	10.4
	Energy efficiency in the public sector	10
	<i>CO2 reduction</i>	
	CO2 levy	127.6
	Energy efficiency in industry	5
	Support to electricity production from CHP	280.1
	<i>International environmental support</i>	
	Purchase of CO2 credits and support to eastern EU	47.1
	Climate support to the Arctic	18.4
	Climate support to developing countries	46.7
<i>Research</i>		
Energy research	226.5	

Source: Danish Ministry of Finance, Finanslov 2009

Finland

In November 2008, the Finnish Government submitted a long term Energy and Climate Policy Strategy Report to the Parliament. The purpose of the report is to define the principal objectives and means of Finland's climate and energy policy for the next few decades, within the context of the European Union.

The strategy sets targets for final energy consumption and electricity consumption in 2020, aiming to keep them relatively stable as compared to current (2008) levels. Final energy consumption is to reach 310 TWh (almost equal to the current level) and electricity consumption is to reach 98 TWh (slightly higher than the 2008 level of just under 90 TWh).

The strategy aims for increases in the share of indigenously generated energy, improved energy efficiency and increased use of renewable energy. The share of renewable energy is targeted to increase to 38% of total final energy consumption through increased use of wood-based energy, waste fuels, heat pumps, biogas and wind energy. The use of forest chips is to be increased by two or three times over current levels. By 2020, wind energy production should reach 6TWh. This will require the construction of a minimum of 700 new 3 MW wind power plants.

In addition, the share of coal and oil in Finland's energy balance is to decrease and energy diversity to increase. Climate and energy financing will increase from €350 million in 2007 to €440 million in 2008, and planned to increase further in 2009, to €580 million. For 2009, the proposed 580 million Euros are divided as specified in table 8. In addition, there are energy or climate related tax reductions adding up to around €50 million.

Table 8: Climate related spendings for 2009, Finland (million €)

Technological R&D:	120
Energy support, e.g. for biofuel and -energy	95
Support for low energy housing	152
Forestry support	65.5
Public transport	92
Kyoto mechanisms	15
Various measures (information, rural development etc)	39

Norway

In January 2008 all the political parties in the parliament, except the Progress Party (FrP) agreed on a national consensus agreement to promote climate policies (“Klimaforliket”): By 2050 at the latest, Norway will implement global emissions reductions corresponding to the domestic emissions level, thereby becoming a CO₂ neutral country. As part of a global and ambitious climate agreement where other industrial countries take on large commitments, the target year for carbon neutrality may be advanced from 2050 to 2030. The consensus agreement assumes that it is realistic to cut 15–17 million tons of CO₂-eq nationally.

Further important measures are to promote the use of renewable energy and public transport. For public buildings, heating by oil will be phased out and eventually banned. Norway is currently in negotiations with the EU on its renewable target under the Renewables directive, and in discussions with Sweden on joining the Swedish electricity certificate market. If these negotiations are unsuccessful, an alternative system which provides similar incentives for renewable production will be put in place to reach the expected requirements for new renewable energy. Norwegian climate related spendings are detailed in Table 9.

The majority of the Norwegian spending on energy efficiency and renewable energies is channeled through the state owned Enova company. For 2009, 1426 million NOK is available for these purposes, of which around half is raised from an earmarked tax on electricity.

In 2009, spendings on research within renewable energy and carbon capture and storage will be increased by 300 million NOK.

On the environmental budget, 173 million is spent on various climate related issues, 375 million is spent on promoting environmental friendly transport, and 715 million NOK is spent on Kyoto mechanisms.

The Norwegian state is funding a significant share of the investment in carbon capture on the Mongstad refinery. In total, the spendings on carbon capture add up to 1925 million NOK for 2009.

The budget also includes a large sum to combat deforestation in developing countries. For this purpose, 1500 million NOK is proposed, with an option to double the spending.

Table 9: Climate related spendings for 2009, Norway (million NOK). Numbers do not include the financial crisis package that was adopted in January 2009

ENOVA (energy efficiency and renewable energy support)	1426
Increased research on renewable energy and carbon capture	300
Environmental friendly transport	375
Kyoto mechanisms	715
Carbon Capture and Storage	1925
Deforestation in developing countries	1500

Sweden

In March 2009 the Swedish government proposed a new integrated climate and energy policy. The main elements of this policy are:

- GHG emissions in 2020 should be reduced by 40% (20 million tons of CO₂-eq) relative to 1990, for businesses not included in the emissions trading system.
- Use of fossil fuel for heating should be eliminated by 2020.
- The total share of renewable energy should be at least 50% in 2020.
- At least 10% of the fuel used in the transport sector should be renewable by 2020.
- The general target for renewable electricity is increased to 25 TWh in 2020 (relative to 2002)
- The Swedish car park should be independent of fossil fuels in 2030.

To reach these goals, the system for green certificates shall be developed further. Already implemented economical measures will be complemented by further fiscal measures. Within the framework of the national target, Sweden will also contribute to emissions reductions in other EU or developing countries.

In their proposition for the 2009 budget, the Swedish Government proposed a climate related package of 3000 million over the years 2009–2011. For 2009, the spendings are 1120 million SEK and includes 230 million for climate investments in other countries, 325 million for environmentally friendly cars, 175 million for domestic climate adaption measures and 245 million for development and deployment of new energy technology, mainly biofuel, biogas and solar cells.

Sweden has a large programme for support of renewable energy. There are substantial grants to energy efficiency measures including heat pumps, energy efficiency in public housing and energy efficient windows for small housing. For 2009, these programmes add up to 970 MSEK in total (including the 2009 climate package). The Swedish programme for environmentally friendly cars has been granted 280 million. 140 MSEK is set aside for development of Sustainable Towns.

Sweden has a substantial effort on Energy Research, administered by the Swedish Energy Agency. For 2009, the proposed budget adds up to 1147 MSEK (including the 2009 climate package). This includes bio fuel

research, power research (including wind and solar power) and building sector research. The budget also includes research for the energy intensive industry.

For 2009–2011 a total of 4000 million have been set aside for climate related purposes on the Foreign Aid budget.

Table 9 Climate related spendings for 2009, Sweden (million SEK)

Domestic Climate adaption	175
Climate investments in other countries	230
Transport and sustainable towns	325
Renewable Energy support	970
Energy Research	1147
Climate related foreign aid	1300

5. Conclusions

The report analyzes the impacts of the new rules for allocation of emission allowances for the third period of the EU emission trading scheme (EU ETS) with a specific focus on the Nordic economies except Iceland.

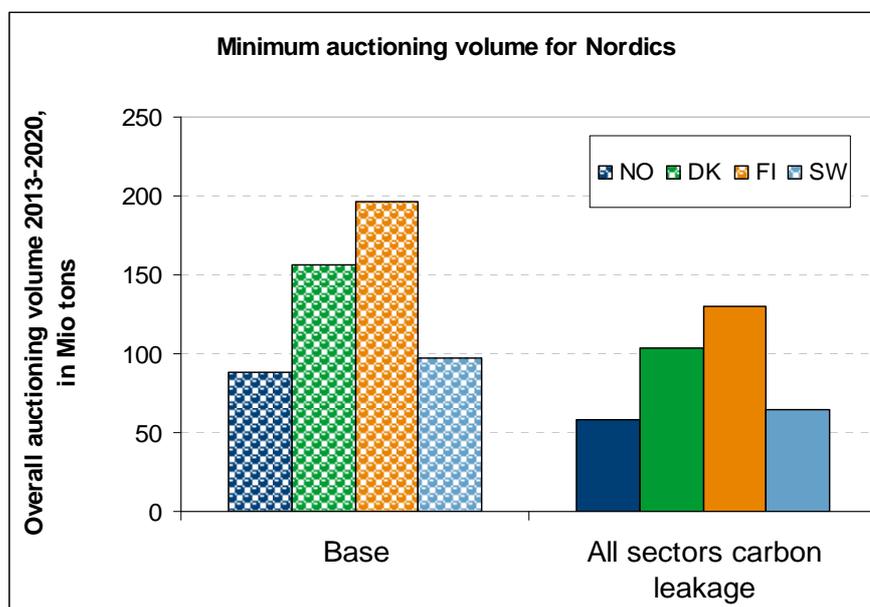
5.1 Auctioning volumes

Of the total number of allowances issued in the third trading period, i.e. from 2013 to 2020, at least 50% will be allocated to member states to be auctioned out to market participants. The allocation of the auctioning volumes between countries is to be done according to shares already set out in the amendment to the ETS Directive. According to these rules, the Nordic countries combined are entitled to less than 5% of the total EU-wide auctioning volume. Of the auctioning volume to the Nordic countries Finland will get the largest share of 36%, Denmark gets 30%, Norway 16% and Sweden 18%.

The actual auctioning volume is derived from the total cap, taking into account that 5% is to be set aside for new entrants, of which at least 75% is to be allocated for free, and the allocation of free allowances to existing installations. Basically, the power and heat sector has to buy allowances for all their emissions, although some exceptions are made for countries with a high share of fossil fuels and limited connectivity with other markets. In addition, highly efficient CHP units, district heating and power generation based on waste gases may receive free allocation. ETS industry installations will also receive free allowances. The general rule for industry is that 80% is allocated for free in 2013, declining to a share of 30% in 2020 and 0% in 2027. Exceptions are however also made for industries exposed to “significant risk of carbon leakage”. Industries found to be eligible under the carbon leakage provision may receive 100% allowances for free throughout the period.

There are several uncertainties with regard to the final implementation of the free allocation rules. It is not clear what CHP units will be defined as highly efficient, and what industries will qualify under the carbon leakage provision. Moreover, industry allocations are supposed to be calculated according to a benchmark, and the benchmarks are not yet defined. Hence, we have had to base the calculations on a set of assumptions.

The figure below (Figure 7, Chapter 2.3) sums up the main findings from the calculation of auctioning volumes allocated to the Nordic countries.



Auctioning revenues under the assumption of respectively no sectors (Base) and all sectors exposed to risk of carbon leakage

Analyzed one at the time, it is the free allocation to industry which has the largest impact on the total auctioning volume. The increase in free allowances when industries are defined under the carbon leakage provision is largest for iron and steel and refineries. Combined, free allocation to all industries would reduce the auctioning volume by 35%.

5.2 Allocation to Nordic installations

Nordic installations are of course also affected by the free allocation of allowances. In the maximum auctioning case (called the Base scenario) Finland, Denmark and Sweden get some free allocation to power and heat²² and all Nordic countries receive free allocation to industrial installations. Sweden gets the largest free allocation, followed by Finland, with Norway and Denmark at about the same level.

When industries are classified as exposed to carbon leakage, the auctioning volume is reduced accordingly, but Nordic industries also get a share of the increase in free allowances. The share of free allowances depends however on the industry structure, which varies significantly between the Nordic countries.

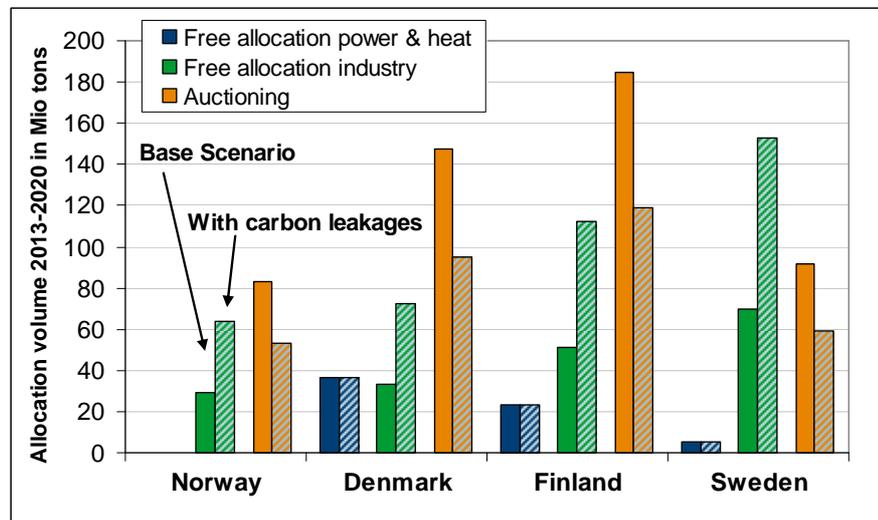
Denmark does not have a large energy intensive industry sector, and receives free allocation mainly for cement & lime production and chemical industry. In Norway the aluminium sector is most important, followed by refineries, and cement & lime. Finland's largest shares are allocated to

²² This includes 100% free allocation to district heating plants and highly efficient CHP plants

iron & steel, pulp & paper, and refineries. Sweden receives the largest free allocation, where allocations to iron & steel, refineries, chemicals, cement & lime, and pulp & paper are significant.

Looking at the total allocation to the Nordic countries, i.e. free allocation and auctioning volumes, only Denmark has a net loss in total allocation when all industries are classified as being exposed to carbon leakage. The Danish allocation is reduced by 20 million t/a over the entire period. Sweden gains twice as much, 42 million t/a. For Finland and Norway the net effect on the total allocation is negligible.

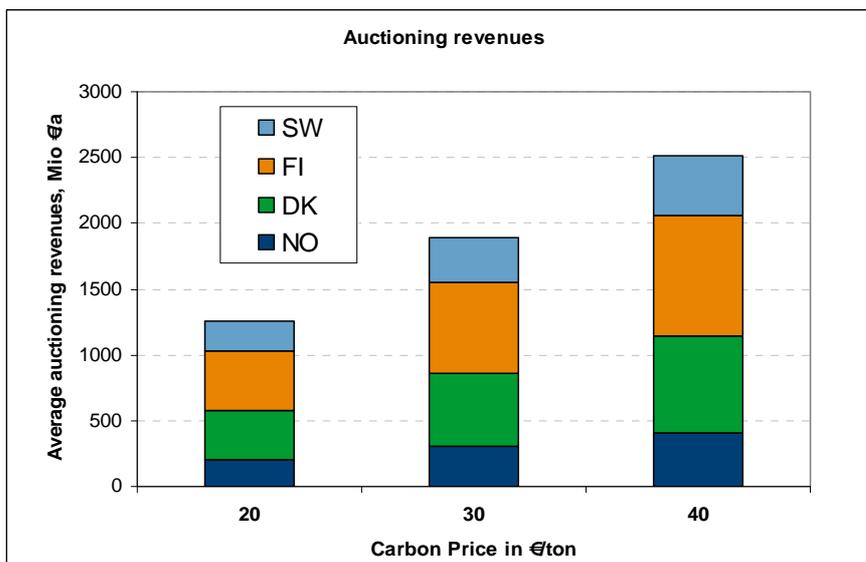
The figure below (Figure 11, Chapter 3.5) shows the changes in allocation in the Base scenario and the full carbon leakage case.



Auctioning and free allocation volumes for the Nordic countries including carbon leakage, compared to the Base Scenario

5.3 Auctioning revenues and recycling to the economy

The auctioning of allowances may prove to be a significant source of revenue for the countries' treasuries. The figure below (Figure 6, Chapter 2.3) shows the calculated auctioning revenues for the Base case (maximum auctioning) with three different EUA price assumptions. As an annual average, Norway would receive 310 million € and Sweden 34 million €. Denmark would receive 552 million € and Finland would receive the highest amount of revenues, 692 million € annually for the medium EUA price assumption of 30 €/ton.



Auctioning revenues for the Base Scenario at different carbon prices

The Directive recommends that at least 50% of the auctioning revenues are earmarked for activities and measures directed at climate change combat, and even lists purposes which may qualify.

Generally, the auctioning revenues can be used in different ways:

1. They can be used to reduce other (distortionary) taxes
2. They can be used to increase the state budget and thereby finance new public activities at the discretion of politicians
3. They can be earmarked for specific purposes

The proponents of earmarking hold that earmarking is beneficial because it provides predictability of financing, which in turn increases long-term efficiency, as opposed to funding exposed to the whims and variability of (annual) public budgets. In addition earmarking increases the public acceptance for taxation, e.g. road pricing which is often earmarked for road construction and other infrastructure.

Most economists do however not recommend earmarking because it breaches with sound budgeting practices in which politicians allocate funds to the most valuable activities. Priorities may indeed change over time, and then earmarking would lead to inefficiency of funding: Either too much or too little may be allocated to the cause for which funds are earmarked.

In the case of earmarking auction revenues, and its possible impacts on the Nordic state budgets, the general result is that it would not necessarily impose a constraint on spending. All Nordic countries spend considerable amounts on the recommended activities already. It is not likely that these spendings will decline in the years to come. Figure 15 shows the government spending on climate combat compared to 50% of the

auctioning revenues for the high and low EUA price. Government spending numbers are rough estimates based on the state budgets for 2009. Based on these estimates it is only Denmark which would have to increase its spending in order to fulfil the 50% earmarking provision if the EUA price turns out to be somewhat above 20 €/ton.

Hence, it can generally be concluded that the Nordic countries are likely to spend more than 50% of the auctioning revenues on measures related to climate change combat.

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Norwegian summary

Resymé

Rapporten analyserer virkningene av de nye reglene for tildeling av utslippskvoter som gjelder for den tredje handelsperioden i EUs kvotehandelsystem (EU ETS), med spesielt fokus på de nordiske økonomiene unntatt Island.

Vi finner at de nordiske landene (Danmark, Finland, Norge og Sverige) i gjennomsnitt vil få tildelt et årlig auksjonsvolum på rundt 63 millioner tonn i perioden, dvs. fra 2013–2020.

Auksjoneringen av kvoter vil dermed bli en betydelig inntektskilde for de nordiske landene. Ved en kvotepris på 30 € per tonn vil de årlige gjennomsnittlige inntektene over hele perioden bli på rundt 1900 millioner € for de nordiske landene samlet.

Beregningen av auksjonsvolumer og inntekter er imidlertid fremdeles usikre ettersom regeleverket for kvotetildeling ennå ikke er endelig fastlagt. Dette gjelder spesielt med hensyn til hvilke bransjer som vil bli betraktet som utsatt for karbonlekkasje, og dermed vil ha rett til å få 100% gratis tildeling som kompensasjon for økt direkte karbonkostnader.

Dersom alle industrisektorene som omfattes av ETS blir klassifisert som utsatt for karbonlekkasje, blir Nordens samlede auksjonsvolum redusert med 35%, og gjennomsnittlig årlig inntekt vil gå ned til 1200 millioner € ved en kvotepris på 30 € per tonn.

Rapporten ser også på øremerking av auksjonsinntekter til tiltak for å bekjempe klimaendringer og konkluderer med at de nordiske landene trolig allerede bruker mer enn 50% av de forventede inntektene på slike tiltak.

Direktivet åpner for at medlemslandene kan kompensere industrier eksponert for karbonlekkasje også for indirekte kostnader som følge av ETS, nærmere bestemt økte kraftpriser. Slik kompensasjon faller ikke inn under de formålene som øremerkede midler kan brukes til.

Bakgrunn og problemavgrensning

EUs målsetning for 2020 er å redusere utslippene av klimagasser (GHG) med minst 20% i forhold til nivået i 1990. Ett av de viktigste virkemidlene for å oppnå utslippsreduksjoner er videreføringen av EUs system for utslippshandel (EU ETS) etter 2012, når den andre handelsperioden er ferdig. I den tredje handelsperioden (2013–2020) skal andelen av utslippsrettigheter som auksjoneres, øke.

Hovedformålet med dette prosjektet er å analysere hvilke konsekvenser de nye tildelingsreglene i ETS vil ha for de nordiske landene, spesielt når det gjelder auksjonsvolum og gratis tildeling til industrien. Videre skal prosjektet undersøke hvordan auksjonsinntektene kan tilbakeføres til økonomien.

Prosjektet har fem hovedelementer:

- Estimere omfanget av auksjonsvolum for EU og Norden.
- Vurdere sektorvise virkninger av økt auksjonering i ETS sett fra et nordisk perspektiv.
- Analyse av virkninger av karbonlekkasje på den nordiske industrien, dens effekt på klima (utslippsreduksjoner), økonomisk effektivitet og hvordan karbonlekkasje kan unngås.
- Kvantifisere av de nordiske landenes inntekter fra utslippsauksjonene under ulike forutsetninger om volumer og kvotepriser.
- Diskusjon av ulike måter å tilbakeføre auksjonsinntektene til økonomien på, både med hensyn til statlig økonomi og økonomisk effektivitet.

Island omfattes ikke av analysen.

Hovedkonklusjoner

Auksjonsvolumer

I tredje handelsperiode av EU ETS vil i gjennomsnitt 68% av det totale europeiske kvotevolumet bli auksjonert. De nordiske landene har krav på mindre enn 5% av EUs totale auksjonsvolum. De nordiske kvotene fordeles mellom Finland (36%), Danmark (30%), Norge (16%) og Sverige (18%). Gjennomsnittlig auksjonsvolum i Norden ventes å bli mellom 350 og 550 millioner tonn, avhengig av hvor mye som tildeles gratis til industri og kraftproduksjon. Det er fortsatt usikkerhet med hensyn til endelig utforming av reglene for gratis tildeling. Dette gjelder for eksempel hvilke sektorer som blir ansett for å ha «betydelig risiko for karbonlekkasje», og som dermed har rett til å få gratis kvoter.

Gratis tildeling til industrien vil ha størst innvirkning på det totale auksjonsvolumet. Dersom alle bransjer får tildelt gratis kvoter, vil dette redusere samlet auksjonsvolum med 35%. Når det gjelder industri som er utsatt for karbonlekkasje, vil mengden gratiskvoter være størst for mineralsk industri, jern- og stålindustri, og raffinierier.

Gratiskvoter

Av de nordiske landene ligger Sverige an til å få den største andelen gratiskvoter, etterfulgt av Finland, og med Norge og Danmark på omtrent samme nivå.

Hvilke sektorer som vil bli tildelt gratiskvoter vil bli bestemt på Europeisk nivå, ut fra felles europeiske retningslinjer, og ikke av hvert enkelt land. Andelen gratiskvoter, knyttet til karbonlekkasje, vil avhenge av de enkelte landenes industristruktur, som varierer betydelig fra land til land.

Danmark har lite kraftkrevende industri, og vil hovedsakelig få gratiskvoter for sement- og kalkproduksjon og for kjemisk industri. I Norge er aluminiumssektoren den viktigste, etterfulgt av raffinerier og sement og kalk. Finlands største andeler vil gå til jern og stål, treforedling og raffinerier. Sverige vil få betydelige tildelinger til jern og stål, raffinerier, kjemikalier, sement og kalk, og treforedling.

Generelt vil andelen gratiskvoter variere avhengig av hvilke sektorer som blir definert som utsatt for karbonlekkasje. For Sverige vil andelen gratis tildeling variere mellom 45% og 73% hvis henholdsvis ingen eller alle industrisektorer anses eksponert for karbonlekkasje. For Danmark og Finland vil andelen variere mellom 30 og 53% og for Norge mellom 26 og 54% av den totale tildelingen.

Karbonlekkasje

Karbonlekkasje er definert som forskyvning av utslipp til land utenfor ETS, forårsaket av skjevheter i markedet generert av prisen på utslipp innenfor ETS. Sektorer som anses å være i fare for karbonlekkasje kan få opptil 100% kvoter tildelt gratis (i henhold til en fastsatt målestokk for hver enkelt industri).

For å vurdere risikoen for karbonlekkasje for en gitt industrisektor må det anslås hvilke følger karbonkostnadene kan ha for EU-bedrifters konkurransevne overfor utenlandske selskaper som ikke er eksponert for tilsvarende kostnader direkte og/eller indirekte.

Kommisjonen har i en svært foreløpig vurdering, basert på de ulike sektorenes handelsintensitet og direkte og indirekte karbonkostnader, konkludert med at følgende sektorer sannsynligvis vil bli definert som utsatt for karbonlekkasje: mineraler, produkter fra koksanlegg, treforedling, metaller, glass og raffinerte petroleumsprodukter.

For de nordiske landene vil gratis tildeling til industrier utsatt for karbonlekkasje ha størst betydning for samlet tildeling til Danmark og Sverige, men med motsatt fortegn. Den totale tildelingen til Danmark reduseres med 7.5 millioner tonn hvis alle industrisektorer anses som utsatt for karbonlekkasje. For Sverige er nettogevinsten 54 millioner tonn, for Finland 2.5 millioner tonn og for Norge 8.3 millioner tonn.

EU-kommisjonen håndterer altså karbonlekkasje ved å redusere kostnadene knyttet til ETS for konkurranseutsatte næringer. Kompensasjon for direkte kostnader gis i form av tildeling av gratiskvoter til utsatte bransjer.

I tillegg kan de enkelte medlemslandene innføre tiltak for å kompensere for indirekte kostnader fra økte kraftpriser. Det er ikke klart hvordan indirekte kostnader skal beregnes og hvorvidt en felles europeisk beregningsmetode vil bli utformet. For de nordiske ETS-sektorene er det spesielt viktig at kompensasjonen for indirekte kostnader tar høyde for den faktiske overveltningen av karbonkostnader i nordiske kraftpriser. Beregningsmetoder som for eksempel er basert på de nordiske landenes sammensetning av kraftproduksjonskapasiteten, vil undervurdere de indirekte kostnadene, spesielt for Norge og Sverige.

Denne typen økonomisk kompensasjon for indirekte kostnader faller ikke inn under kriteriene for øremerking av inntekter slik det er definert i EU ETS lovgivning. Man kan altså ikke bruke eventuelle øremerkede auksjonsinntekter til å kompensere ETS-industriene for indirekte kostnadsøkninger.

Auksjonsinntekter

Auksjoneringen av utslippskvoter kan vise seg å bli en betydelig inntektskilde for de nordiske landene. Norge forventes å tjene i gjennomsnitt 310 millioner €, Sverige 344 millioner €, Danmark 552 millioner € og Finland 692 millioner € årlig ved en kvotepris på 30 €/ tonn.

Direktivet anbefaler at minst 50% av auksjonsinntektene øremerkes tiltak for å bekjempe klimaendringer. Basert på de nordiske landenes statsbudsjett for året 2009 kan det konkluderes med at de nordiske landene allerede bruker mer enn 50% av de forventede auksjonsinntektene på slike tiltak. EUs anbefaling vil dermed ikke nødvendigvis legge føringer for hvordan de nordiske landene disponerer auksjonsinntektene.